THE AEROPLANE and ASTRONAUTICS

NOVEMBER 23, 1961

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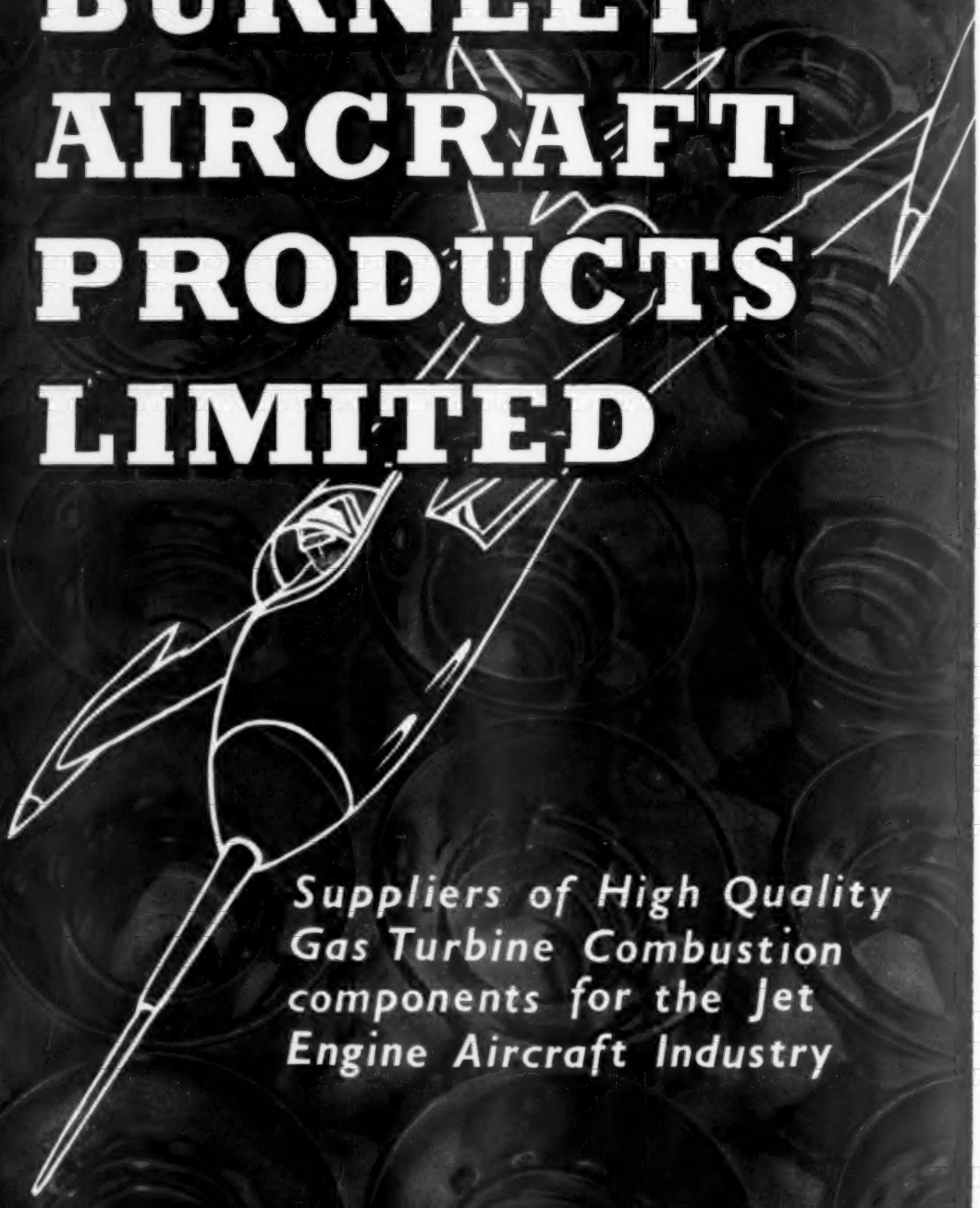

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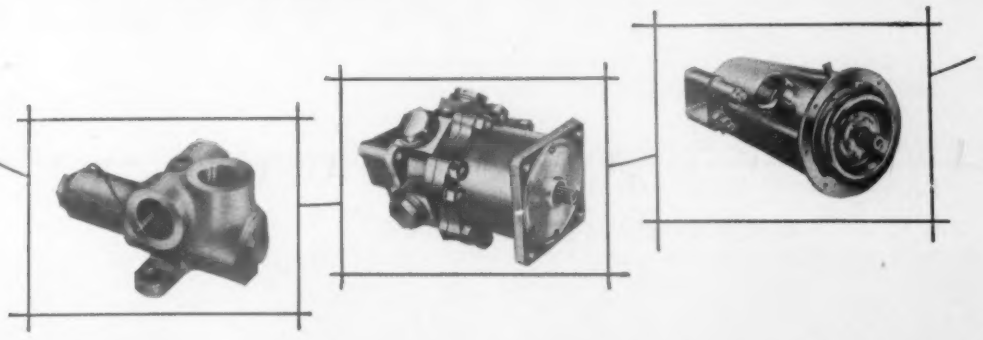

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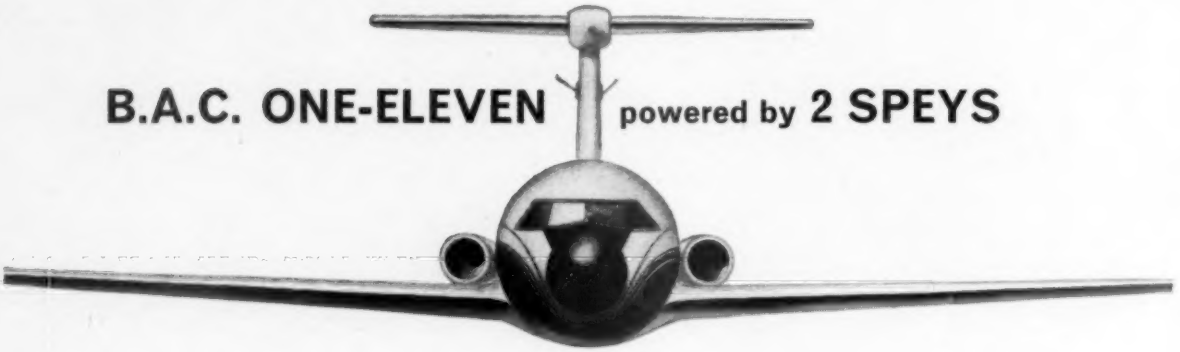

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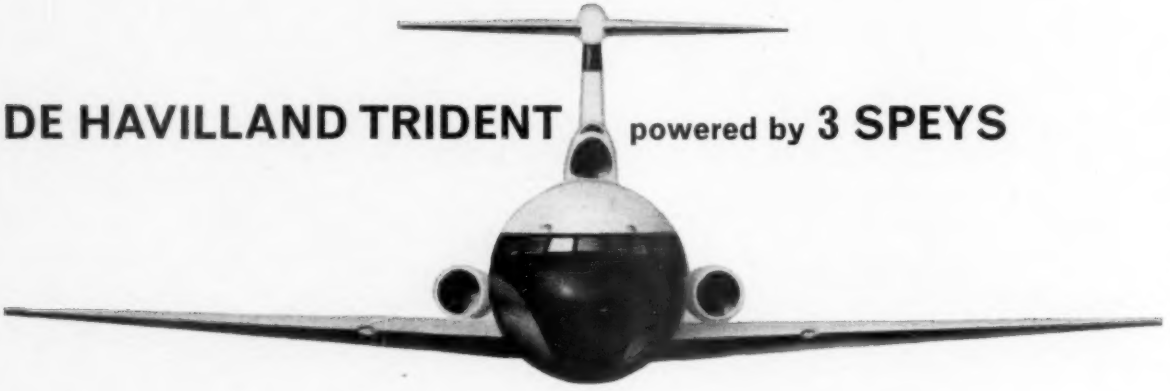

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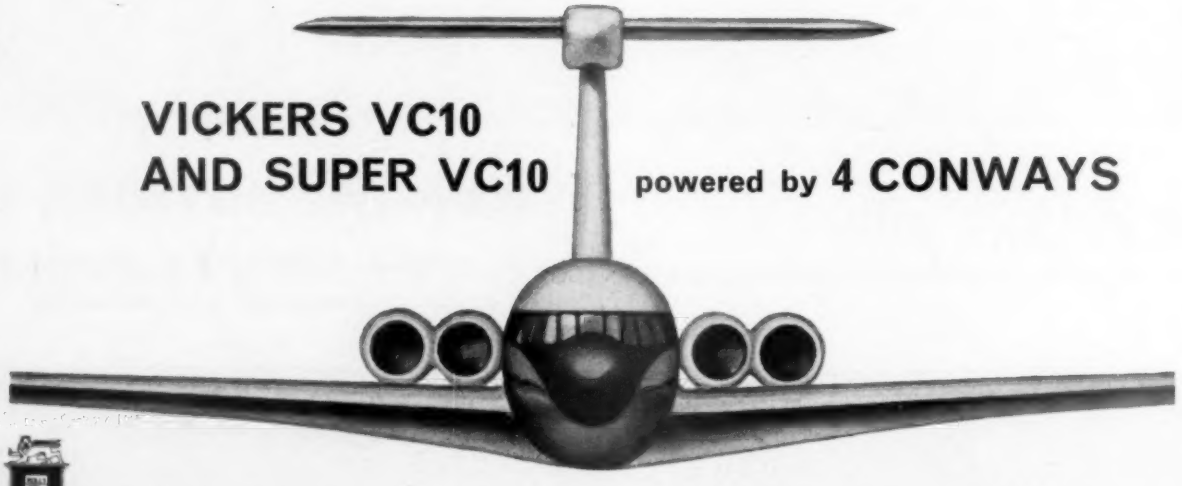

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Anglo-French Collaboration

Conspicuous signs of the liaison already existing between the British and French aircraft industries have not been lacking during the past week. Reports have been published concerning the steps taken both at Government and industry levels towards the development of a supersonic transport. It is clear that this collaboration has gone far, and in fact, the next step must now await those who control the purse-strings in London and Paris.

It will be recalled that the British Government has already spent around £350,000 with B.A.C. for a design study of a supersonic Mach 2.2 airliner. Equally, in France Sud Aviation have gone ahead with their study. Collaboration between the two companies is well established and there have been many conversations between Dr. Russell and M. Satre. The scene is therefore set for the next stage which would be to marry the larger British design to its small French counterpart. It is confidently believed that the resultant long-medium-range aircraft would have transatlantic capability. But to demonstrate this a further extensive design study would be necessary.

The question which awaits an answer is can the holders of the purse-strings on each side of the Channel be persuaded that the resultant Anglo-French Mach 2.2 machine will have a long enough prospective life to make Government investment worth while?

Our guess is that the next step is likely to be a further joint design study backed 50/50 by the French and British Governments, and that the desirability of pressing ahead with this will be officially debated in the weeks ahead.

Orders Wanted Now

No developments have done more to keep the British flag flying in the field of aviation than the success of the Short SC-1 with its Rolls-Royce vertical lift engines and the Hawker P.1127 with its single Bristol Siddeley deflectable jet. Consequently, it will be with mixed feelings that people will have learnt of the agreement signed at Kingston last week when it was agreed that Hawker Aircraft would link with French, Dutch, Belgian, German and American firms in connection with the submitting of tenders for a new N.A.T.O. VTOL fighter. It is not true that there is any question of putting any design into production at this stage—as some reports have suggested. The purpose of the grouping is to ensure the strongest possible potential for building the design when a tender has been prepared and has been accepted.

It is clearly going to be a long time before any decision is reached and, as has been pointed out, the reaching of a decision will have to be achieved under conflicting political pressures. At the moment only one design of aircraft is flying with which the various N.A.T.O. Air Forces could obtain any operational experience and this is the Hawker P.1127. It is true that only two machines exist and they would scarcely be described as operational. Nevertheless, three or four dozen operational P.1127 could obviously be produced years before any consortium-built N.A.T.O. fighters would be forthcoming. With these actual machines to fly on operations the N.A.T.O. Air Forces would have some practical experience with which to evaluate the tenders for the BMR-3 design. And seeing the importance of the part which the R.A.F. has to play in these matters, a start might well be made by the Air Ministry. Unfortunately, the latest answer to a Question in Parliament suggests that the British Government will not go it alone.

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In this way Air Cdre. C. M. Wight-Boycott, Commandant of the R.O.C., summed up the Corps' purpose when No. 5 Group's new Watford H.Q. and Operations Room were opened on November 18 by Alderman J. R. Hicks, Mayor of Watford and himself a war-time observer there. He was received by the Commandant; the Deputy Commandant, Obs. Capt. W. Rusby; and the Group Commandant., Obs. Cdr. G. A. D. Bourne.

The new H.Q., the 13th such building of a planned total of 29, is 20 ft. underground, heavily protected against nuclear attack and so self-contained that its observers could exist healthily and comfortably for several weeks. To these Grp. Ops. H.Q., come information by land-line from some 1,500 posts, two-thirds of which now have an underground room added to their above-ground spotting post, with the remainder soon to be operational.—WREN.

Air Matters in Parliament

Civil Aviation (Eurocontrol) Bill

IN the House of Commons on Nov. 18 MR. PETER THORNEYCROFT, Minister of Aviation, moved the second reading of this Bill which, he said, arose from an agreement between the United Kingdom, France, Belgium, the Netherlands, Luxembourg and the German Federal Republic, and provided the basis for air traffic control in Britain and Europe. Its terms took account of expected development within five, 10 and 15 years.

There would be a permanent commission for safety of air navigation and an air traffic agency operating from Brussels; the object of the Bill was to help these plans along. A provisional association had already been formed and would start to function between 1963 and 1966.

The air traffic control system would be concerned at the outset with the upper air space—as yet undetermined internationally, but in Britain defined as being above 25,000 ft. The agency's job would be to monitor the pattern of air movements on radar screens, to establish the speed, height and course of individual aircraft, and thence to control traffic from the paramount standpoint of overall safety. This was a formidable task and would require increasingly complex and sophisticated equipment.

Money for air traffic control would have to be spent anyway, and it would be greatly to Britain's advantage technically to share the costs of this service on an international basis. Whereas at present cash was raised by airport charges and rents, the Bill provided that the Minister of Aviation should pay to the organization such sums on account of its expenses as he might, with Treasury consent, determine (see last week's issue, p. 632). The present estimated cost was £3m. on capital and £2m. on current account.

The provisions of the Bill found favour on both sides of the House MR. C. M. WOODHOUSE, Parliamentary Secretary to the Ministry of Aviation, said the House would remember that plans already existed for integrating and developing our present extensive system to embrace control of both military and civil aviation, and this was a timely moment to marry it with the system of neighbouring countries. The organization was novel in that it had certain supra-national powers. It could, for example, give valid orders to British pilots flying over this country. This was no loss, but a pooling of sovereignty.

Aircrew Recruitment

In a written answer to SIR A. V. HARVEY (Cons., Macclesfield), who had asked the Secretary of State for Air on Nov. 8 to make a statement on the R.A.F. aircrew position, and in particular to indicate what shortage of personnel he envisages in two or three years hence, MR. JULIAN AMERY replied that the position has improved in recent months, but we still need more recruits. As our equipment grows more complex we shall need more recruits with high academic and personal qualities. This is, however, a long-term problem, and no shortage of aircrew is foreseen in the next two or three years.—O. W. H. COOKE.

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R.O.C. Report

"TWO factors discourage a potential aggressor—a powerful retaliatory force and an efficient civil defence force to minimize the effects of enemy action. This country has both; and the Royal Observer Corps plays a vital part in each of them. It maintains its traditional rôle in supplying information to the R.A.F., information which at the outset might help trigger action by Bomber Command's V-Force and Thor missiles. And in the event of nuclear attack it would plot and report, to the Home Office for them to initiate civil defence action, nuclear explosions and fall-out, from the Shetlands to the Channel Islands, from Norfolk to Northern Ireland."

In this way Air Cdre. C. M. Wight-Boycott, Commandant of the R.O.C., summed up the Corps' purpose when No. 5 Group's new Watford H.Q. and Operations Room were opened on November 18 by Alderman J. R. Hicks, Mayor of Watford and himself a war-time observer there. He was received by the Commandant; the Deputy Commandant, Obs. Capt. W. Rusby; and the Group Commandant., Obs. Cdr. G. A. D. Bourne.

The new H.Q., the 13th such building of a planned total of 29, is 20 ft. underground, heavily protected against nuclear attack and so self-contained that its observers could exist healthily and comfortably for several weeks. To these Grp. Ops. H.Q., come information by land-line from some 1,500 posts, two-thirds of which now have an underground room added to their above-ground spotting post, with the remainder soon to be operational.—WREN.

Air Matters in Parliament

Civil Aviation (Eurocontrol) Bill

IN the House of Commons on Nov. 18 MR. PETER THORNEYCROFT, Minister of Aviation, moved the second reading of this Bill which, he said, arose from an agreement between the United Kingdom, France, Belgium, the Netherlands, Luxembourg and the German Federal Republic, and provided the basis for air traffic control in Britain and Europe. Its terms took account of expected development within five, 10 and 15 years.

There would be a permanent commission for safety of air navigation and an air traffic agency operating from Brussels; the object of the Bill was to help these plans along. A provisional association had already been formed and would start to function between 1963 and 1966.

The air traffic control system would be concerned at the outset with the upper air space—as yet undetermined internationally, but in Britain defined as being above 25,000 ft. The agency's job would be to monitor the pattern of air movements on radar screens, to establish the speed, height and course of individual aircraft, and thence to control traffic from the paramount standpoint of overall safety. This was a formidable task and would require increasingly complex and sophisticated equipment.

Money for air traffic control would have to be spent anyway, and it would be greatly to Britain's advantage technically to share the costs of this service on an international basis. Whereas at present cash was raised by airport charges and rents, the Bill provided that the Minister of Aviation should pay to the organization such sums on account of its expenses as he might, with Treasury consent, determine (see last week's issue, p. 632). The present estimated cost was £3m. on capital and £2m. on current account.

The provisions of the Bill found favour on both sides of the House. MR. C. M. WOODHOUSE, Parliamentary Secretary to the Ministry of Aviation, said the House would remember that plans already existed for integrating and developing our present extensive system to embrace control of both military and civil aviation, and this was a timely moment to marry it with the system of neighbouring countries. The organization was novel in that it had certain supra-national powers. It could, for example, give valid orders to British pilots flying over this country. This was no loss, but a pooling of sovereignty.

Aircrew Recruitment

In a written answer to SIR A. V. HARVEY (Cons., Macclesfield), who had asked the Secretary of State for Air on Nov. 8 to make a statement on the R.A.F. aircrew position, and in particular to indicate what shortage of personnel he envisages in two or three years hence, MR. JULIAN AMERY replied that the position has improved in recent months, but we still need more recruits. As our equipment grows more complex we shall need more recruits with high academic and personal qualities. This is, however, a long-term problem, and no shortage of aircrew is foreseen in the next two or three years.—O. W. H. COOKE.

Steps Towards an S.S.T.

JOINT Anglo-French development of a Mach 2.2 medium range airliner is expected to be the outcome of discussions between the two Governments and between British Aircraft Corporation and Sud Aviation. Although no official announcement has yet been made, collaboration has been agreed in principle by Mr. Thorneycroft and M. Buron respectively the British and French ministers of aviation and transport.

B.A.C. work on a supersonic transport design study, the Bristol 198, has been continuing since last autumn on a Ministry contract on which more than £300,000 has been spent. In France, Sud and Dassault agreed last year to collaborate in an S.S.T. programme, but both companies prepared their own designs for evaluation. The Sud design, known as the Super Caravelle, is understood to be favoured.

French work has been concentrated on a smaller design than the Bristol 198, and the joint project which is expected to evolve from the next phase of the programme would not be primarily intended for transatlantic operations, although a long-range version of the design might be developed to meet the needs of B.O.A.C. and Air France. The use of British engines such as the Bristol Olympus—already being developed for the TSR-2—is also understood to have been agreed.

Concentration in Europe on a Mach 2.2 medium range transport leaves the U.S. industry free to proceed with the Mach 3 transatlantic type which is now regarded in America as a vital prestige production. A division of effort along these lines was suggested by M. Hereil, president of Sud Aviation, in the course of his recent Plesman Memorial Lecture (see our issue for Oct. 5, p. 442).

In the U.S., meanwhile, the U.S.A.F. has taken on responsibility for administration of contracts and technical support for the supersonic transport research programme which has been initiated by the Department of Defense, NASA and the F.A.A. Congress recently appropriated $11 million to get this programme under way, and most of this money will go to industry for research into certain specific problem areas.

Man-powered Flight Development

MORE news of man-powered aircraft activity—this time from Hatfield—came last week with the first flights of the machine designed and built by the de Havilland group. During these flights, the machine made one of more than 100 yd. in a straight line and at an "altitude" of several feet. The craft was flown by Mr. J. Phillips, a de Havilland test pilot.

This is the second of the man-powered aircraft, being built to compete for the £5,000 prize offered by Mr. Kremer, to fly; the Southampton University's project was flown a couple of weeks ago. The "private venture" group at Hatfield is led by Mr. J. Wimpenny. No details of the craft have been given.

At a lecture to the Man-Powered Aircraft Group of the R.Ae.S. on Nov. 17, Professor Terence Nonweiler said that penalties for aerodynamic deficiency were more severe in man-powered flight than in any other form of aviation. The requirement of minimum power needed for flight would demand a lift coefficient of between 1.5 and 2; but this would hardly be practicable because, even if such a figure could be reached without stalling the wing, it would be so near stalling point as to be liable to stall suddenly without warning.

Such a high lift coefficient, if achievable, should reduce the drag by 15% and laminar flow—also if achievable—should reduce it by 20%. Making the wing-tips elliptical, instead of square, would give a further drag reduction of about 4%.

He recommended eliminating the ailerons and using the rudder for lateral control, though this would entail landing strictly into wind. The pilot would also have to learn the difference between steering in the air and steering on the ground with a wheel coupled to the rudder.

Aviation News in General

AERONAUTICAL DIARY. — THE AEROPLANE Diary for 1962 is now available. Prices are 4s. 9d. for the rexine-covered edition or 6s. 9d. in its leather-bound form. By post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1, prices are 5s. 3d. and 7s. 3d. respectively.

BELGIUM'S FIRST F-104G.—First Super Starfighter for Belgium—a Lockheed-built aircraft—has flown at Palmdale. Majority of the 100 on order for this air force will come from the Western European manufacturing group. Another 14 Super Starfighters produced by Lockheed are to be shipped to Belgium for assembly there.

L.O.H. PROGRESS. — Development contracts to Hiller ($6,542,375), Hughes ($6,352,879) and Bell ($5,782,019) have been awarded by the U.S. Army for each company to build five evaluation models of its light observation helicopter. Six months' evaluation at Fort Rucker, Ala., will decide the choice for production.

CESSNA SORTIE.—Gavin Youl, a Tasmanian racing driver, left Britain last week-end with two companions to fly Jack Brabham's Cessna 180 to Australia, where it will be sold. World Racing Champion Brabham now operates a twin-engined Cessna 310.

HELICOPTER LICENCE.—A licensing agreement for the production in Germany of Agusta-Bell helicopters has been concluded between Merckle Flugzeugwerke and Agusta.

EXECUTIVE STOP PRESS.—Late news on some of the executive jets which are reviewed in this issue on pages 670-672 is that eight designers have been sent from Heinkel to work on the detailed design of the Swiss-American Aircraft Corporation SAAC-23. First flight is still scheduled for April, 1962, and 17 orders have so far been placed for the first batch of 25 aircraft. The SAAC-23 will also be made available for military use, including its application as a NASARR weapons systems trainer, like the North American T-39B. The Lockheed JetStar is also in the running for this rôle with the German Luftwaffe, which has two of these four-jet executive types on order for VIP transport.

PIPER DISTRIBUTOR. — Vigors Aviation, U.K. agents for the Piper range, has announced the appointment of the Marquess of Kildare, a director of the company for the past five years, as managing director. He will succeed Wg. Cdr. T. A. Vigors, who is leaving the company but will remain on the board in an advisory capacity.

PERSONAL PLANES MEET.—The 1962 Shackleton Aviation Weekend will be on May 4-6; the venue has yet to be decided upon.

AIRTECH AND CHARTAIR.—A merger has been concluded between Airtech Ltd., and Chartair Ltd. The undertaking, assets and business of the latter have been acquired by Airtech, whose capital has been increased to a total of £250,000.

ANTI SUCCESS.—A Nike Zeus anti-missile missile was launched from Point Mugu, Calif., over the Pacific Ocean in a successful test on Nov. 16. In two previous test-launchings, missiles were destroyed when they veered from course.

P.R. POD.—A prototype photographic reconnaissance pod for R.C.A.F. CF-104 Starfighters was successfully test flown at Palmdale, Calif., last month. Top, the prototype Lockheed-built CF-104 fitted with the pod. Bottom, close-up of the pod which contains a Vinten 70-mm. camera and Computing Devices of Canada electronic control system.

TWIN MOONS.—A double satellite payload was successfully placed in orbit on Nov. 15 by a Thor-Able Star restartable rocket launched from Cape Canaveral. One was the navigation satellite Transit IVB weighing about 200 lb.; it embodies a small nuclear generator. The other, "shaped like a door knob," extends itself by coil-like antenna to a length of 120 ft. as an experiment in Earth-orientating a satellite by means of gravity.

SPACE CONTRACT.—Standard Telephones and Cables, Ltd., have been awarded a contract to supply a transmitter for use by the G.P.O. in satellite communication experiments to be carried out next year in co-operation with the American authorities. Equipment will be installed at the site on Goonhilly Down, Cornwall, where the 85 ft. dia. steerable antenna is being erected. The transmitter will operate in the 2,000 Mc/s band, delivering an FM output of 10 kW.

STUCK UP.—No attempt was made to recover the 300-lb. re-entry capsule from Discoverer XXXIV because of a fault which developed in the satellite. The launching occurred on Nov. 5.

POLAR SUCCESS. — Discoverer XXXV was successfully launched from Vandenberg A.F.B. and went into polar orbit. It carried test equipment for the Midas and Samos surveillance and reconnaissance programmes.

(*Continued on page 681*)

Commercial Aviation Affairs

ARGOSY SERVICE. — A B.E.A. Argosy completed its first revenue-earning operation on Nov. 17 when it flew from Manchester to Paris with 6½ tons of freight. The load comprised shoe-making machinery. Scheduled services by Argosy are now expected to start on December 1, a few days later than at first planned (see our previous issue).

EXECUTIVE "E" LICENCE.—An "E"-class licence (see our previous issue) has now been granted by the A.T.L.B. to Executive Air Transport, Ltd. The decision can be taken as an indication that the Board is satisfied with this operator's experience and financial resources.

RANGE INCREASE.—Additional fuel tanks are to be fitted in the centre sections of the three Irish International Airlines' Boeing 720s to reduce the frequency of diversions. They will increase the range by about 350 miles.

JET SPEED LIMIT.—On Dec. 18 the F.A.A. will introduce a new regulation which limits to 250 knots the speed of all aircraft approaching an airport when they are within 30 miles and below 10,000 ft. Following the collision over New York last December, the F.A.A. proposed a similar rule in May which would have imposed the limit over a radius of 50 miles.

JET TRADER ORDER.—T.C.A. is reported to be planning the purchase of two Douglas DC-8F Jet Traders, with an option on two more.

BLACKPOOL AIRPORT. — The Blackpool town council has agreed to purchase Squires Gate Airport from the Ministry at a reported price of £185,000. Silver City Airways has offered to operate the airport on behalf of the council.

TRANSPORT WITH THE MOSTEST. —A Boeing 707 in service with Continental Airlines has become the first of the type and probably the first jet transport in the World to complete 10,000 flying hours. Since its delivery in April, 1959, this aircraft—registration N70773—has averaged 10.82 hrs. a day. Continental has consistently achieved the highest jet utilization in the U.S. and its fleet of five 707s has averaged 11.23 hr. a day since entering service.

EUROPEAN DEBUT.—First Lockheed JetStar to come to Europe is this aircraft which Krupps of Essen have acquired for executive use. The delivery flight from Idlewild to Dusseldorf was made in 7 hr. 23 min.

POTEZ 840. — Flight testing of the Potez 840 was resumed on Nov. 3. The aircraft had been grounded for repair and engine overhaul following its wheels-up landing on Sept. 29 (our issue for Oct. 12).

A.T.L.B. Decisions and Applications

(Scheduled Services Only)

Licence Granted

A2098. Skyways Coach Air. Lympne/Manston-Albenga. IATA fares.

Licences Refused

A1289. Starways. Glasgow-Manchester-Liverpool-Tenerife and (*A1377*) Glasgow-Liverpool-Palma.

A1774. Mercury Airlines. Manchester-Swansea/Sandown/Exeter/Newquay.

No Applications

TURBINE FAILURE.—The turbine disc of a Pratt & Whitney JT3D turbofan in a T.W.A. Boeing 720B failed in flight on Nov. 5, and pieces of the disc punctured the cabin. The incident occured at 25,000 ft. An emergency descent was made and the cabin emergency oxygen operated at 19,000 ft. The aircraft landed safely at Boston.

JULY TRAFFIC.—Capacity offered by the U.K. airlines on scheduled services in July increased by 18% but total traffic fell by 1.6% because of the B.O.A.C. strike. The private companies offered 26.4% more capacity ton-miles and their overall load factor fell from 69.4% to 65.9%.

RUNWAY COLLISION.—A collision occurred at a runway intersection at Logan International Airport, Boston, on Nov. 15 between a Northeast Airlines Viscount, which was landing, and a National Airlines DC-6 which was taking off. Both aircraft were severely damaged and about 12 passengers were injured.

L.A.P. STRIKE OVER.—The strike of London (Heathrow) Airport loaders (see last week's issue, p. 633) ended on Nov. 17 and work was restarted for the first shift (06.30 hrs.) on Nov. 19.

FIUMICINO STORM.—Two Caravelles—one Air France and one Sabena—were overturned on the apron at Leonardo da Vinci Airport, Fiumicino on Nov. 12 by high winds. Whirlwinds and rainstorms closed the airport twice during the day.

FORTY-FOUR SERVICE.—Flying on MATS routes across the Pacific from Los Angeles to Tokyo, Flying Tiger's five Canadair Forty-Fours averaged 11½ hr. daily utilization each in the week to Nov. 10. Regularity was 78.6%.

CALEDONIAN STARTS.—The first passenger carrying flight by Caledonian Airways is scheduled to be made on Nov. 29 from London to Barbados. A second operation on Dec. 12 will be to Lourenzo Marques and the first flight from Prestwick will be on Dec. 21 carrying 99 passengers to New York. Two DC-7Cs are being leased from Sabena (see our previous issue).

(*Continued on page 681*)

News About People

CENTO POST. — Air Vice-Marshal L. W. G. Bower, C.B., D.S.O., D.F.C., is to become British representative on the CENTO permanent military deputies group in Ankara in April, 1962, with the acting rank of Air Marshal. He has been A.O.C., No. 19 Group, Coastal Command, since May, 1959.

GOODYEAR PRESIDENT. — New president of the Goodyear International Corporation is Mr. R. V. Thomas, vice-president since 1958. He succeeds Mr. F. T. Magennis who has retired after 44 years with the Goodyear organization. Mr. Thomas is also made a director of the parent Goodyear Tyre and Rubber Co.

FERRANTI EXPANSION. — Mr. M. C. Curties has been appointed to the new Ferranti post of senior project engineer (VTOL systems) in the company's Aircraft Equipment Department at Bracknell. Mr. Curties joins Ferranti after four years as B.E.A. senior development engineer (instruments).

P.1127 SPECTATORS.—A delegation from the Italian Air Ministry, headed by Gen. Casero, visited Dunsfold on Nov. 14 to see the Hawker P.1127. They are reported to have been very favourably impressed by the demonstration put on for them.

DIRECTORSHIP.—Mr. G. H. Doust, general manager since June, 1960, of Plessey International, Ltd., the overseas sales organization of the Plessey Group, has been made a director of the company.

Supersonic Transport Navigation

AN "outstanding paper professionally presented" was the general verdict of members of the Institute of Navigation who were fortunate enough to hear Major W. L. Polhemus' lecture last Friday on the "Navigation and Control of Supersonic Aircraft." In charge of the U.S.A.F. Fort Worth team which developed the navigational procedures for the Mach 2 B-58 Hustler, Maj. Polhemus was also a navigator of the B-58 which made the 1,095-m.p.h. crossing of the Atlantic from New York to Paris at the time of the Le Bourget air show in June of this year.

To bring his audience's awareness to the operational problems of the supersonic transport (SST), the lecturer opened by emphasizing the tremendous distances required to accelerate to cruise speed and altitude, and later to decelerate for landing, making the aircraft's use on routes much less than 1,500 miles rather difficult to justify. On stage lengths such as London to New York the traveller may look forward to a flight time as short as 2 hr. 12 min. if his aircraft has Mach 3 performance; similarly, the Great Circle route between Los Angeles and London will require 3 hr. 11 min. to negotiate.

SST Separation Standards

The need for defining the standard of navigation accuracy to be required of an SST as preparatory to examining particular navaid systems led to a meeting in New York in September, under the chairmanship of the American Institute of Navigation technical committee for air. Present at the meeting were representatives of eight commercial airlines, nine electronic systems manufacturers, the F.A.A. and NASA. Its purpose was to specify an aircraft separation standard for domestic and international supersonic air transport operations which will, as a minimum, meet the safety standard we enjoy in commercial transports with due consideration being given to the improvements in navigation equipment and operator technique which may be expected during the next five years.

Findings of the group recommended a lateral separation of 50 n. miles between tracks on the same route with a navaid equipment variability equal to or less than 7.14 n. miles over the entire route; a longitudinal separation of 10 min. of time between aircraft and an equipment variability equal to or less than 1.4 min. of time; and a vertical separation of 1,000 ft. between flight levels with an equipment variability equal to or less than 140 ft. Within the framework of these criteria, or standards of variability, it was recommended that all navigation systems must equal or surpass these standards, where the term "navigation systems" was defined as including the operator (navigator or pilot) of the equipment as well as the equipment itself.

Performance Considerations

Taking a typical American proposal for a Mach 3, stainless-steel aircraft with four to six engines, a maximum gross weight of 450,000 lb., a supersonic cruise range of approximately 3,000 n. miles and a cruise altitude from 60,000 to 80,000 ft., Maj. Polhemus stated that acceleration to supersonic speed will occur at an altitude between 36,000 ft. and 46,000 ft. The variation in altitude will be dependent upon geographical location, sonic-boom consideration, temperatures at acceleration altitude, wing geometry, etc. In polar latitudes or in areas where the acceleration can be effected over water it may be feasible to accelerate at a lower altitude. In such cases the limiting criteria will be in the correct temperature/altitude combination.

Deceleration and descent to subsonic optimum altitude can require as much as 19 min. and 418 miles, to 5 min. and 95 miles. The variation in range and time results from the decision as to how much *g* force one is willing to impose on the passenger. The longer deceleration is based on a value of 0.053 *g* at a best range deceleration. The shorter deceleration is comparable to the military deceleration of 0.27 *g* in the B-58—entirely acceptable to a person conditioned to the manœuvre, but perhaps a little too stimulating for the uninitiated. The following planning factors have been used in determining flight time between cities and in evaluating the control problem:—

	Time h. m.	Distance (n. miles)
Take-off and climb to acceleration altitude	12	90
Acceleration to Mach 3	15	285
Cruise at optimum (approximate maximum)	1 44	3,000
Deceleration to M=0.91 opt. alt. (.05 *g*)	19	418
Approach and land	10	70
Total	2 40	3,863

Fuel flow during this acceleration phase, under optimum conditions of altitude and temperature, will be of the order of 200,000 lb. per hr. Acceleration time and distance will require from 15 min. and 285 miles, to 19 min. and 360 miles. Cruise altitude fuel flow will vary from 100,000 lb. per hr. at the heavy gross weight end of the cruise leg, to 70,000 lb. per hr. as the aircraft nears dry tanks.

Speed Criteria

The lecturer believes that a good case can be made for using ground speed as the speed criteria. The navigation equipment of the SST will undoubtedly have velocity sensors which are both accurate and reliable, thus facilitating the use of ground speed as a velocity reference. If the autopilot Mach-hold mode of operation can be designed to accommodate a command signal from the ground-speed loop of the navigation system, the capability would be extremely useful in guaranteeing longitudinal separation between aircraft and entry time to the approach corridor.

In the past, American jet aircraft have been designed to operate most economically at one particular Mach number with perhaps a tolerance of M = ±0.02. With the B-58 operating at supersonic speed the U.S.A.F. finds it can reduce the Mach number by 0.2 to 0.3 without significantly changing the fuel consumption. If the stainless steel SST is designed with the growth potential claimed by its NASA proponents, it is likely that the performance curve (specific fuel consumption) will be reasonably flat in the area of Mach 3, thus permitting variations of cruise speed as great as M = ±0.2. Such a range would be sufficient to compensate for a 100-kt. headwind, or loss of T.A.S. due to below-standard temperatures.

Navigational Requirements

One of Maj. Polhemus' objectives is to bring together in useful form the data which have been scattered about at meetings he has attended and to match them against some kind of common denominator. For this, a one-hour segment of track at a speed of Mach 3 has been selected, with a ±25 n. miles-wide airway superimposed upon it, so that a 1° heading-system error would put the aircraft out of the 50-mile band in less than one hour.

A cross-wind which cannot be measured, or which is measured inaccurately, has the same effect. A 25-kt. error in the wind applied to dead reckoning would put the aircraft on the edge of the corridor in one hour with a zero heading error. With as little as 0.25° of heading error, gyro drift, and so on, the aircraft would exceed the limits of the corridor in 45 min. On the other hand a Doppler radar or inertial system designed to a specification of 1% of the cross-track velocity component would sense a cross-wind component of as little as ½ kt. in a 50 kt. wind—quite adequate to the needs of the airway user. If this gross measurement would make possible a 99.99%-reliable system most navigators would be very pleased. The lecturer was sure that a 0.5% system would satisfy anyone's needs.

Turning to the various means for updating aircraft position, Maj. Polhemus gave their order of accuracy as: (i) automatically controlled radar (0.25 to 1 n. miles); (ii) Loran C, up to 1,500 n. miles from station (0.5 to 1 n. miles); (iii) manually plotted radar fixes (1 to 3 n. miles); (iv) automatic celestial data (3 to 4 n. miles); (v) Tacan, Omni/DMET, etc. (3 to 4 n. miles); (vi) Loran A, up to 800 miles (1 to 5 n. miles); (vii) manually plotted celestial data (5 to 6 n. miles).

From B-58 Mach 2 flying it has been found that with an automatic navigation equipment reliability of 60%, the human navigator using conventional tools is more accurate for 20% of the time and equal to automatic system accuracy for a similar period. But when the B-58 system (valued at $1.1 million, comprising 14 different units totalling 1,700 lb. and occupying about 160 cu. ft.) is working properly the human navigator cannot compete with its precision.

In describing an integrated navigation system for a Mach 3 transport, Maj. Polhemus placed considerable emphasis on the need for redundancy, checks and balances within the system to keep any one component from drifting too far from the beaten trail, and guaranteeing the prerogative of the system operator to select and to mix his systems as he feels to be necessary. The most frequently voiced criticism on the other side of the Atlantic with regard to the expensive and sophisticated navigation systems is that the basic heading and airspeed information, the mainstay of basic D.R., are either hidden from the operator, or are not the original data and are the result of mixing in some exotic circuit.

Air Transport

Abbotsinch and Aldergrove

ABBOTSINCH may not be available as Glasgow's new airport until 1965, a year later than previously expected. The programme of constructing terminal buildings, a control tower and a main runway cannot be completed until after the Royal Navy moves out of Abbotsinch. The move to R.N.A.S. Brawdy had been planned for October, 1963, but the Ministry of Aviation said last week that there is doubt over this date being kept.

Meanwhile, a daily check is being maintained on the runways at Renfrew, where the operation of Vanguards is giving rise to some anxiety. Since Vanguards came into use, two major runway cracks have developed and have been repaired. As Renfrew is to be closed, it is not wished to spend large sums of money on runway repairs or on additional passenger-handling facilities, which are already inadequate. The number of passengers passing through Renfrew in the first half of 1961 was 22% higher than in the same period last year, and at the present rate of growth more than a million persons will use the airport in 1963.

Work on the new terminal building and apron at Aldergrove, designated as the future Belfast Airport, is expected to be completed by 1963. The terminal will be a self-contained unit under civil administration, entirely separate from the R.A.F. operations at the airport. Initially, the apron will be large enough to accommodate 10 aircraft and the terminal will be capable of handling the traffic flow expected by 1968, with a busy hour rate of about 600 passengers.

Architects for the building are W. H. McAlister and Ptnrs. of Belfast. Yorke, Rosenberg and Mardall (responsible for the Gatwick terminal) have acted as honorary planning consultants and the apron design is by the Ministry of Aviation.

Can Northeast Survive?

THE possibility that Northeast Airlines will be forced into receivership or suffer a foreclosure action remained open as we went to press, despite efforts by the Hughes Tool Co. to help the ailing airline. The Shell Oil Co. notified the airline last week that no credit sales of fuel or oil would be allowed in future. Hughes Tool Co. had previously undertaken to guarantee payments to Shell from Oct. 20, and up to Nov. 10 these guaranteed payments totalled about $412,000.

On Nov. 10, Hughes ended both its guarantee and its plans to acquire control of the airline, until the C.A.B. clarified the legal situation. Hughes Tool is solely owned by Howard Hughes, who also has an interest in Northeast through Atlas Corp., a holding company in which he is the largest shareholder. Atlas owns at least 54% of the Northeast stock, but told the company last August that it was unable to continue providing financial support. Hughes was invited to take over the Northeast stock and said he would do so if the C.A.B. approved. A 1958 C.A.B. ruling ordered Hughes to refrain from acquiring control of any airline without such prior approval.

In addition to guaranteeing the fuel payments, Hughes offered Northeast a $5 million loan early this month, but the C.A.B. called for details of "all agreements, understandings and transactions" between Hughes and Northeast to be filed within 10 days. As this left Hughes with no assurance that he would not be penalized, his offer was withdrawn on Nov. 10.

Hughes Tool Co. is already a major creditor of Northeast, which borrowed $9,500,000 from the company last May; accrued interest on this loan of $354,000 is now owed. Vickers (Aviation), Ltd., is another creditor, owed $6,748,760 in respect of the Northeast Viscount fleet. Last week, a Vickers' spokesman in Washington said Northeast had been in default on principal repayments since June 15 and on interest payments since Sept. 15.

Monthly reports filed by Northeast with the C.A.B. show a deteriorating position. For the 12 months up to June 30, the company incurred a total loss of $10,832,127. A further loss of $644,333 was reported in July. At July 31, the company's total current assets were given as $9,741,528, with current liabilities of $18,989,750. The liabilities included a bank loan of $2,060,000 due for repayment on Dec. 31.

The possibility of a merger between Northeast and one or more U.S. trunk operators (our issue for July 27) now seems remote. On Nov. 6, T.W.A. told the C.A.B. that it would not proceed with its application for a New York-Florida route or its prospective merger with Northeast. Two days later, Eastern, National and Mohawk also withdrew their joint offer for a merger with the company, although they said they might make a new offer later.

Northeast's authority to operate between New York and Florida expires on Nov. 27, but the airline will continue to operate on this route until its renewal application has been decided by the C.A.B.—not before next January. This is one of Northeast's most important routes.

Rationalizing a Freight-rate Structure

FLYING TIGER LINES' long-considered revision of its basic freight-rate structure has been approved by the U.S. Civil Aeronautics Board and the new tariff went into effect on Oct. 16.

The rate structure, which is keyed to the use of a Canadair CL-44 fleet, is the result of an attempt to establish a flexible tariff which is related to the actual costs. The basis is a commodity rate system, but goods are divided into seven classes according to density (i.e., weight per cu. ft.) with higher density loads flown at lower rates. There is only one weight break-point (at 5,000 lb.), whereas the U.S. normal commodity ratings have up to six such points at which there are reductions for the higher weight of shipment. The Flying Tiger rates are based strictly on the actual mileage flown.

The new system is the result of 18 months of work done in co-operation with Canadair and under the direction of Prof. Stanley H. Brewer, whose cargo-potential studies are well known. Teams investigated 10 U.S. industries in order to define the distribution characteristics of different commodities. Flying Tiger also analysed its own freight movements over a 12-month period.

Reorganization in Italy

NEW and improved status will be given to civil aviation in Italy if a Bill, shortly to be presented, is approved by the Italian parliament.

The title of the existing Ministry of Transport will be changed to the Ministry of Transport and Civil Aviation and its inspectorate general will be divided into three sections—covering air transport and airport services and administration. Telecommunications and navigation aids will remain the responsibility of the Air Ministry until an autonomous body has been established. A technical commission will co-ordinate civil and military traffic patterns.

PASSENGER COMFORT.—The Aviobridge now in use at Schiphol Airport, Amsterdam, is seen here with a K.L.M. DC-8. It consists of three telescopic parts, permitting extension from 59 to 118 ft., and can be swung through 180 deg. and elevated at its "free" end to a height of 13 ft. The manufacturers are N.V. Aviobridge, Papendrecht, Holland.

Air Transport . . . .

America's Project Beacon

A Summary of the Report of the Task Force on U.S. Air Traffic Control

"Accordingly, I ask you to begin at once to carry out those recommendations of the report which you believe will move the airways program forward rapidly and efficiently. In the course of your implementing the recommendations of the report you will prepare a plan and design a system to utilize those elements of the air defense system which you believe can be advantageously used in meeting air traffic control requirements. . . ."

IN these words, to the administrator of the U.S. Federal Aviation Agency, President Kennedy ordered, earlier this month, an immediate start on a programme of modernization of the air traffic control system following the report of the eight-man team which had worked, at the President's request, on Project Beacon. This Task Force went into action last March and its 146-page study was issued on Nov. 12.

The study discusses the performance of the present means of air traffic control and recommends an improved system for development and implementation. The principal recommendations include the mandatory use of an altitude-reporting transponder for all aircraft above 12,500 lb. gross weight; the segregation of aircraft according to performance and status in busy terminal areas; the use of continuously and automatically available aircraft-position information as a basis for all future air traffic control; and the maximum civil-military integration. It is significant that the study group has gone to great trouble to see that its recommendations make full allowances for the necessary freedom of movement for private and business aircraft.

The study opens with estimates of expected future traffic in different categories—both total flights made and terminal-area operations. Below are figures for 1960 terminal-area operations and the estimates for 1965, 1970 and 1975. It will be seen that general aviation is expected to account for 67% of all the 1975 terminal-area operations (the F.A.A. expects IFR flying by general aviation aircraft to increase by 270% in the coming 15 years).

All Operations	1960	1965	1970	1975
	(Millions)			
General aviation	37.0	49.7	57.8	65.2
Air carrier	8.0	9.8	11.9	14.1
Military	25.7	21.5	19.5	17.4
Total	70.7	81.0	89.2	96.7
IFR Operations				
General aviation	0.6	1.0	1.5	2.2
Air carrier	4.0	5.5	7.5	9.9
Military	2.3	2.0	1.8	1.7
Total IFR	6.9	8.5	10.8	13.8
VFR Operations				
General aviation	36.4	48.7	56.3	63.0
Air carrier	4.0	4.3	4.4	4.2
Military	23.5	19.5	17.7	15.7
Total	63.9	72.5	78.4	82.9
Helicopter	6.7	9.1	13.9	15.2

Military flights are expected, by 1975, to decrease by 36%, general aviation flights to increase by 80%, and air carrier operations to increase by 78%, making an overall increase of 50%.

The report considers that the present A.T.C. system "is being expertly operated by a highly skilled organization" and that the en route system is not, at present, overloaded. This system is, however, inefficient and will reach overload along the busier airways within the next few years. Its inefficiency stems from separation standards necessitated by a dependence on calculated position and pilot reports rather than on radar control.

Most serious is the mixture of IFR and VFR traffic along the busier airways, particularly in view of the high speed of many aircraft. There are also problems of frequency congestion and cockpit and controller overload due to the requirement for very frequent position reporting.

In terminal areas the attainment of safety and efficiency is most difficult. The problem is compounded by inadequate and overloaded airports in many of the busy terminal areas.

The radar which has been provided for A.T.C. in many of the major terminal areas is being effectively used and has made the difference between a reasonable operation and one which would be completely intolerable.

The mixture of IFR and VFR traffic is most serious in terminal areas. Aircraft are climbing or descending most of the time and no altitude information is available to the controller except by means of intermittent pilot reports. The number of aircraft which must be held at points relatively close to the airport is frequently large, due to the lack of any means of establishing a flow control by beginning the sequencing of aircraft at points remote from the terminal area. The system of ground control

(Continued on page 667)

Points from the Report

Controlled traffic in the U.S.A. is expected to increase by about 300% between 1960 and 1975.

The most serious difficulty with the present A.T.C. system is the mixture of IFR and VFR traffic along busier airways and in terminal areas.

Fourteen major U.S. airports are already overloaded, or within 10% of maximum capacity. By 1970, 48 will be overloaded unless new airports or additional runways are provided.

Short-term improvements include the segregation of aircraft according to performance in crowded terminal areas.

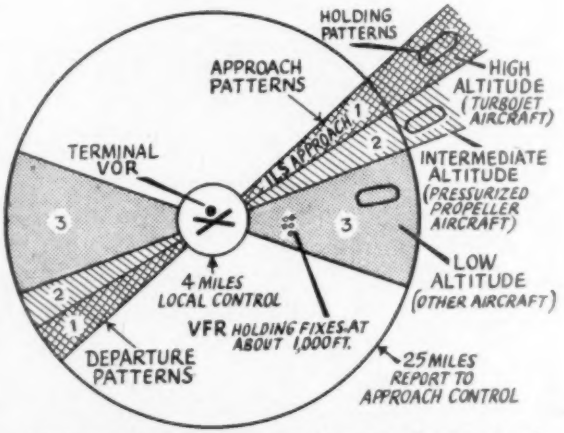
Future control should be based on continuously and automatically available aircraft-position information.

All aircraft above 12,500 lb. gross weight should be required to carry altitude-reporting transponders.

The combined SAGE/F.A.A. radar network should be employed for en route control and, with flight plans, to provide all the basic control information.

On certain busy airways a speed limit should be established for all aircraft flying below 8,000 ft. m.s.l.

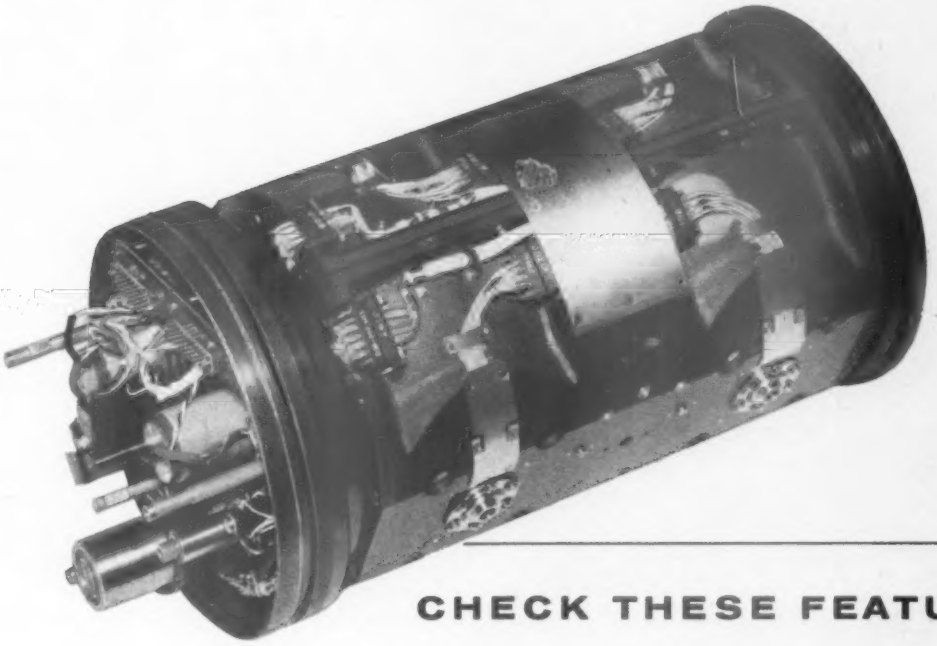
Special corridors and "tunnels" should be provided for use by unequipped VFR aircraft.



The proposed segregation system by means of approach and departure corridors for aircraft of different capabilities. The corridors would be "controller concepts" only, with the aircraft vectored as appropriate. The high-altitude control area extends out to a 50-mile radius.

SPERRY

TWIN-GYRO PLATFORM



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THE AEROPLANE and ASTRONAUTICS
NOVEMBER 23, 1961

THE CLEAN WING MEANS

BIGGER PAYLOADS FROM SHORTER FIELDS

POWERED BY

BRITISH AIRCRAFT CORPORATION

ONE HUNDRED PALL MALL LONDON SW1 ENGLAND

THE AEROPLANE and ASTRONAUTICS
NOVEMBER 23, 1961

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PG69

High or low . . . ? Perhaps swept . . . ? There are several different wing positions open to the modern aircraft designer. The Herald, Viscount 810 and Comet demonstrate three of these. However, wherever they place their wings, Handley Page, Vickers and de Havilland all place their confidence in Dagenite aircraft batteries, thus continuing a long-standing relationship with our company.

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Air Transport . . . .

(*Continued from page 666*)

and departure clearance delivery is cumbersome and inefficient.

The present terminal-area system achieves safety of operation through delay. As the level of traffic in the more crowded areas increases, the system will require substantial improvement to avoid increased delay and a serious, if not impossible, problem of maintaining safety.

Short-term Improvements

There are, the report says, a number of ways in which the present air traffic control system can be improved in the near future:

1. Aircraft in the crowded terminal areas can be segregated in accordance with performance and VFR traffic can be separated from IFR traffic.
2. In these same high traffic terminal areas, all aircraft landing at controlled airports can be required to contact approach control at a specified distance from the airport.
3. There are many airport improvements requiring no further development which can be implemented at once.
4. Improved radar presentations can be provided on an expedited schedule.
5. The present programme of incorporating computers in the traffic control system is a good one and should be continued. Data-entry devices are needed for the controller.
6. The receipt of flight plans and the issuance of clearances can be automated.
7. Results of recent research in aircraft conspicuity should be implemented promptly.

Recommended System

The major recommendations for a substantially improved A.T.C. system are:

1. Control should be based on aircraft position information continuously available on the ground and independent of the pilot's navigational information.
2. On certain busy airways, and in congested terminal areas, controlled and uncontrolled traffic should be segregated and speed limits instituted for VFR traffic.
3. All traffic above 24,000 ft. m.s.l. in and adjacent to high mountainous areas of the country, and above 14,500 ft. m.s.l. in the rest of the country, should be under positive control. On certain busy airways the positive control requirement should be extended down to 8,000 ft. m.s.l.
4. To enable the non-instrument-rated pilot to use these positive control areas under VFR conditions, a new category of flight should be established. This might be known as Controlled Visual Rules (CVR). Under these rules the pilot would enter the traffic control system and receive separation service, but would maintain aircraft attitude by reference to the ground.
5. Below 8,000 ft. m.s.l. on selected busy airways (see 2 above), a speed limit should be established for all traffic.
6. All aircraft above 12,500 lb. gross weight should be required to carry altitude-reporting beacon transponders for use both en route and in terminal areas.
7. The combined SAGE/F.A.A. radar network should be employed for en route control, and, along with flight plans, should provide the basic control information.
8. In congested terminal areas aircraft should be segregated in accordance with performance and special arrival and departure ramps designated.
9. All aircraft landing at controlled airports within these designated terminal areas should be required to contact approach control at a specified distance from the airport.
10. Altitude information should be obtained through the use of altitude-reporting beacon transponders carried in the aircraft. Studies indicate that a short-range beacon, satisfactory for terminal-area use, should be obtainable for no more than $500 (£180). When such a beacon becomes available it should be required in all aircraft landing at controlled airports within designated congested terminal areas.
11. Special corridors and "tunnels" should be provided for unequipped VFR aircraft landing at uncontrolled airports or crossing the terminal area.
12. With complete position information available on the ground, pilot reports should be reduced drastically and controller and pilot load and frequency usage held to reasonable levels.
13. General-purpose computers should be employed in both the en route and terminal-area portions of the system to process flight plans, issue clearances, make conflict probes, generate display information, establish landing sequences and perform other routine tasks of assistance to the controllers.
14. Special express routes must be established in terminal areas to accommodate the greatly increased helicopter traffic envisaged in the near future.

The Task Force considers that five years is a reasonable and necessary time for the implementation of the major features of the system. It is estimated that capital expenditures of $500 million (£180 million) will be required, but that the present F.A.A. research and development budget of $65 million (£23 million) per year will be adequate. The present F.A.A. five-year plan involves a capital expenditure of $250 million.

Air Defence Integration

The report recommends that the radars of the SAGE system, with existing and planned F.A.A. radar, should be employed for air traffic control and that the present air traffic control system, rather than the SAGE direction centres, should be modified and supplemented for en route control.

This recommendation will not only provide a more satisfactory and lasting solution to the A.T.C. problem but it will, in the long run, be substantially more economical in capital and operating costs. At the same time, it will permit maximum flexibility in the manner in which "the air defence mission" is carried out.

Airports and Navigation Aids

Fourteen major U.S. airports are overloaded or within 10% of maximum capacity. By 1970, 48 of the major airports will be overloaded unless new ones are provided, or additional runways and related facilities added. In addition, excessive delay is occurring at many airports due to an accumulation of inefficiencies—even though these airports are not operating to capacity.

The report considers that the present nation-wide system of VOR will, with the addition of DME, be adequate for many years, but that "special navigation facilities" will be required in the very near future to permit efficient helicopter operations in some of the terminal areas.

Significantly, the report adds that "a more precise navigational means" will be required to permit closer paralleling of airways on a few very high-density routes.

No satisfactory collision avoidance or proximity warning system appears, in the Task Force's view, to be feasible in the very near future.

An Air-freight Case History

BY using air freighting for the routine distribution of its products, a U.S. company has reduced its inventory of spares by 10-15%, representing a saving of some $80,000. This fact emerges from a study made by Curtis Industries, Inc., of the results of using air distribution for the past six years. The Cleveland-based company makes key-cutting machines, and was one of the first in America to adopt air freighting as a regular means of distribution.

Freighting by air was adopted for three basic reasons: "to obtain greater profits; to utilize the most economical and expeditious method available for moving products to customers; and to improve sales effectiveness by increasing sales volume without increasing selling expense."

The most significant result of the decision was that it became possible to close a warehouse which had previously been maintained at Oakland, California. Products had been moved to this warehouse by road from Cleveland, for onward distribution to the western states as required. Closing the warehouse not only reduced costs but also improved customer service and increased the profit potential by shortening the reorder cycle.

A survey of the shipping costs showed that air was cheaper than surface when total distribution costs—including the cost of operating the warehouse—were taken into account. Typical savings which could be made on single shipments from Cleveland were: to Seattle, $73.79; to Los Angeles, $68.77; to San Francisco, $13.27; and to Salt Lake City, $151.21.

Independent Viewpoint

THE need for closer co-operation between the independents and the Corporations, and the possibly damaging effect of a too-severe system of investigation into the financial strength of the smaller companies, were among the points made by Mr. L. C. Hunting, president of BIATA, at the Association's dinner on Nov. 14.

Better co-operation could, Mr. Hunting said, lead to solutions of many common problems in the day-to-day running of the airlines and might even lead to the presentation of a united front at IATA traffic conferences and (as one vast complaint!) at meetings with the Ministry of Aviation.

Over-strictness in financial investigations could, through the premature death of some operators, lead to heavy competition by foreign airlines for the British I.T. traffic which was now being carried by the independents.

On the subject of safety, he said that there had been three serious accidents to BIATA-member aircraft since May, 1959. This was not good enough, but, statistically, the record was no worse than the World average. Nor were old aircraft, certificated to meet later requirements, more dangerous than newer aircraft.

Mr. Hunting was proposing the toast of British air transport. Mr. Peter Thorneycroft, Minister of Aviation, replied in amusing, if not very informing, terms.

Air Transport . . . .

Short-haul and Seasonal Traffic

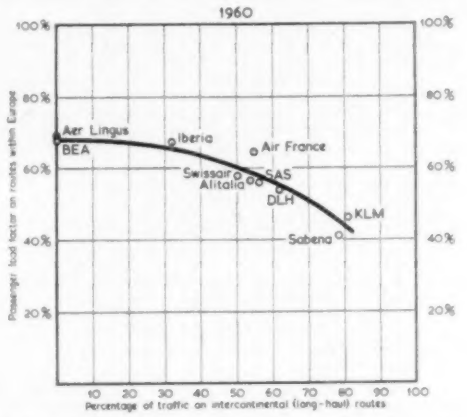
For the Seventeenth British Commonwealth Lecture, Lord Douglas of Kirtleside took as his subject "The Progress of European Air Transport, 1946-1961," and made particular reference to B.E.A. in this context. The paper, which was given in London before the Royal Aeronautical Society on Nov. 16, is summarized here.

EUROPEAN air services are the second most important regional network in the World. Representing 10% of the World total passenger-miles, they trail behind the domestic system of North America, but are nearly twice as large as those of South America and 10 times as large as those in the whole of Africa. Intra-European air traffic is growing at a faster rate than the World average and B.E.A. traffic more rapidly than the European average. B.E.A. carried about 25% of all intra-European traffic in 1960. Essential characteristics of European air traffic are its short average length of haul and its high degree of seasonal traffic variation.

The average compound rate of growth within Europe has been over 15% for the past decade. The three principal reasons are: reduction in the level of air fares, both in absolute terms and in relation to other prices (particularly surface fares); increases in national income and its distribution; and improvements in the quality of air travel.

Although there has been a revolutionary improvement in the operational nature of European air services in the past 10 years, intra-European air services as a whole are not yet financially self-sufficient. Of the nine main intra-European airlines, only two (including B.E.A.) made a profit on European operations in 1960 and one other broke even. The average "revex ratio" (relationship between revenue and expenditure) was 96, i.e., revenue was 4% short of expenditure.

The primary reason for this situation was the low load factor at which many European routes operated. B.E.A.'s load factor of 68.4% in 1960 was eight points higher than the European average. The three airlines with the worst financial results in 1960 had the lowest load factors. The European operations of almost all the nine main airlines would have broken even in 1960 if the average load factor had been 65%. In European conditions, load factors of 70%—or higher on high frequency routes—give a fully acceptable standard of public service.



Correlation between percentage of traffic on intercontinental routes and European load factor.

Many European airlines look at their European routes as feeder services for long-haul traffic and base their economic outlook on spurious arguments about the marginal costs of operations. Those airlines which get the majority of their traffic from long-haul operations are the ones which operate their European services at low load factors.

European experience in recent years has shown that the best way of minimizing the adverse effects of economic and

B.E.A. in European Air Transport

The ability to specialize in short-haul air transport has been an important element in both B.E.A.'s success and B.E.A. leadership in Europe.

B.E.A.'s passenger traffic has increased 12-fold in 13 years. In the same period, World traffic increased six-fold and European traffic nine-fold.

B.E.A. took seven years to achieve profitability (which it did in 1954/55) and has remained profitable in each year since then. The B.E.A. profit in 1960/61, before paying interest on capital, was equivalent to a return of 8% on capital and reserves actively employed in B.E.A. operations during the year.

In a 13-year period, the reduction in B.E.A.'s real cost per C.T.M. has been as much as 70%. The five most important contributory factors are: use of specially designed aircraft; increased utilization of aircraft; increased staff productivity; economies of higher intensity operations; effective economic planning and financial control.

Much of B.E.A.'s effort in the operating field during the past 15 years has been directed towards increasing the safety of operations from all aspects. B.E.A. is now well ahead of other airlines in developing a greatly improved altimeter and many aircraft are already equipped with these instruments.

B.E.A. is still the only major World airline using pictorial display of the aircraft's position as a navaid, although there are signs that the philosophy behind it is now being accepted elsewhere in the air transport world.

Although much progress has been made in the development of landing aids, the net result of B.E.A.'s endeavours over the past 15 years has been merely to keep pace with the increasing complexity of aircraft, so that significant reductions in operating minima have not been achieved as yet. There is, however, much more hope for progress in the future with the development of blind landing techniques.

B.E.A. has established a World-wide reputation for being a leader in commercial matters. An airline has to produce more capacity than it is able to sell, and has to have resources available for peak periods which are idle or under-utilized in the off peak. In the case of B.E.A. the "primary waste" (excess of C.T.M. over L.T.M.) is 35% of capacity operated, and "secondary waste" (additional C.T.M. which could be produced with equipment on hand) represents another 16% of capacity produced.

Waste capacity is reduced, in B.E.A., by rationalizing capacity to achieve the highest practical load factors and by pricing policies designed to maximize the off-peak demand. Special fares for inclusive tours are important promotional devices and, in five years out of eight since 1953/54, B.E.A. has carried more I.T. passengers than all the British independent airlines together.

B.E.A. is convinced that there will be an upsurge in European air freight traffic in the next five years—for two reasons. First, the relatively new concept of "total distribution costs" is beginning to gain wide acceptance and there is a greatly increased awareness among manufacturers, distributors and shippers generally of the advantages which air freight offers. Secondly, the airlines are now in a position to satisfy the demand economically, by producing greatly increased freight capacity on passenger services and by using all-cargo aircraft.

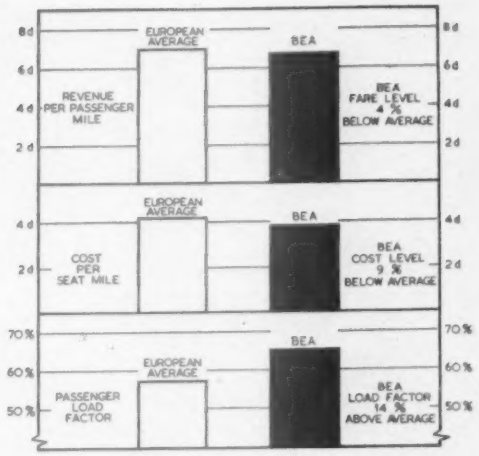
B.E.A. carries more passengers on domestic services than any other airline outside North America. A combination of a 20% lower fare level and 5% higher costs on domestic services made the break-even load factor 10 points higher than that achieved on international services. Passenger load factor achieved was 8% above the international level, but, because of the low level of freight traffic, the total load factor was only one point higher. Profitability on the domestic routes depends on greater efficiency, further expansion of output and elimination of "frills."

political nationalism in air transport is to recognize the existence of these considerations and to find satisfactory ways of existing with them. It is the tacit adoption of this philosophy throughout Europe which explains, in large part, the degree of co-operation which the airline industry has achieved.

Governmental co-operation is essential for the safety and efficiency of airline operations. European national boundaries no longer make any sense in the context of controlling aircraft in the air. A major step forward has been taken with the establishment of Eurocontrol.

Co-operation between the airlines in Europe has been even more impressive than that at government level. Co-operative schemes have been worked out in commercial affairs, scheduling, traffic handling, maintenance, supplies, communications, research and accounting. For the small airlines the pressures towards co-operation are irresistible; for the larger airlines the benefits to be gained are very considerable, particularly because the larger capacities of new aircraft make it more difficult for an individual airline to maintain adequate frequencies on many routes.

Pooling agreements have provided, in many instances, the way for overcoming what were previously regarded as intractable politico-commercial air transport problems.



Intra-European operations, 1960

European Traffic Trends

STATISTICS from the Air Research Bureau in Brussels show that passenger traffic in the second quarter of 1961 increased by 12.7% over the total for the same quarter of 1960. This rate of growth was below that for the first quarter of 1961 (20%) and for the whole of 1960 (19%). As capacity increased by 20% (the same as in the first quarter of 1961) there was a drop of 3.8 percentage points in load factor, but this was a considerably less serious recession than that suffered on the North Atlantic. Provisional information from the A.R.B. indicates that the growth rate was maintained at around 13% in the third quarter, final statistics for which are not yet available.

Various recent trends in European operations continued in the second quarter, including a further increase in the proportion of first-class to tourist traffic, with a 38% increase in the number of first-class seats offered. The average stage length per sector passenger also increased again, from 585 km. in the second quarter of 1960 to 608 km. in the second quarter of 1961. The average distance per flight went up from 540 km. to 553 km., and the average number of seats per aircraft increased to 64.

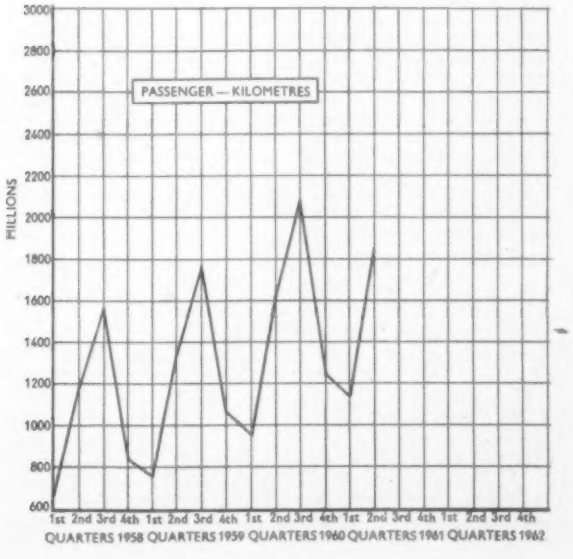
One reversal of recent trends was the distribution of freight traffic—which increased by 10.4% over the 1960 second quarter. Most of the expansion recently has been on all-freight services, but, in the second quarter of 1961, almost all the additional freight was carried on passenger services.

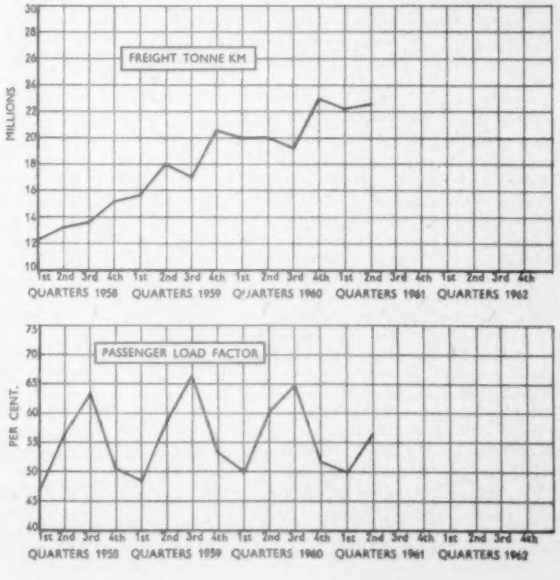
A study of the passenger-traffic development by geographical regions shows that above-average growth was recorded in Iberian, Irish Sea and north and central German areas. London-Paris traffic increased by 9.2%, but other cross-Channel traffic showed an increase of only 1.6%. There was an actual decline of traffic in the Paris and Benelux and south German and Austrian areas. Of the major European terminals, four recorded sector-traffic increases of slightly more than 20%—Athens, Frankfurt, Nice and Zurich. The increase at London was 19.4%.

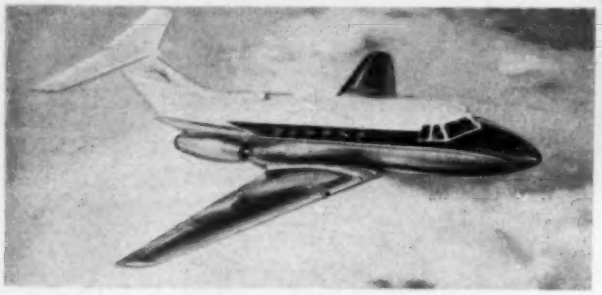
The breakdown of passenger-miles by aircraft category in the second quarter of 1961 was as follows: twin-engined piston, 10.4%; four-engined piston, 15.1%; turboprop, 30.4%; turbojet, 41.7%; helicopter, 0.05% and others, 2.4%.

	2nd Quarter		1961 as % of 1960	12 mths. ending		1961 as % of 1960
	1960	1961		June 1960	June 1961	
Seat-km. (million)	2719	3271	120	9296	11226	121
Pass-km. (million)	1639	1848	113	5438	6349	117
Pass. load factor %	60.3	56.5	—	58.5	56.6	—
Freight tonne-km. (million)	20.5	22.7	110	79.3	88.3	111
Mail tonne-km. (million)	4.3	4.5	105	17.8	18.8	106

Intra-European traffic includes all traffic carried on international routes originating and terminating within the European continent and countries bordering the Mediterranean. Airlines included in this survey are: Aer Lingus, Air France, Alitalia, B.E.A., B.O.A.C., Finnair, Iberia, Icelandair, K.L.M., Lufthansa, S.A.S., Sabena and Swissair.



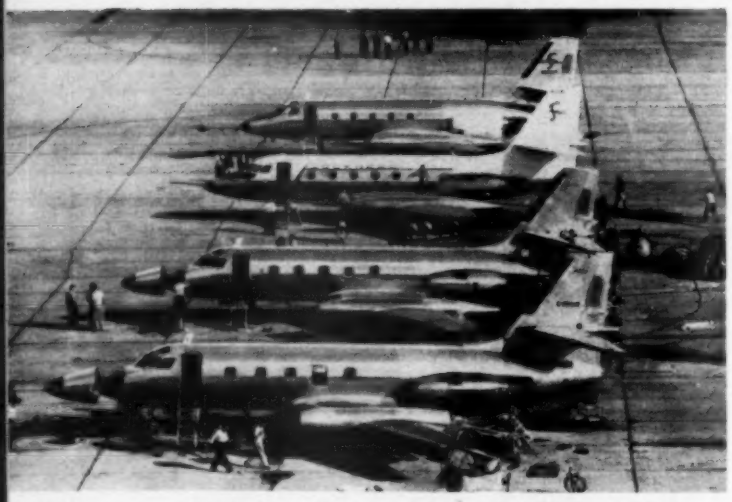




The Executive Jet Race

IN the World picture of executive flying, which for practical purposes means North America and Europe, there is a wide gap in performance between the broad mass of business aircraft and current airline equipment. The size of this gap has only become really marked since the almost universal introduction into airline service of the large jet transport, a year or two ago, and its existence has led to a widespread concentration on the development of suitable corporate aircraft designs with something approaching comparable performance.

Just how widespread is indicated by this review of current projects for executive jet transports, which include over a dozen active design studies from almost as many countries. These have reached various stages of completion, but one design—the Lockheed JetStar (which is also the sole four-engined representative)—has recently entered executive service after successful development and civil certification, while another, the North American Sabreliner, is operating with the



FOUR OF A KIND.—Deliveries of the $1.3 million Lockheed CL-329 JetStar for business flying began in September, and 18 are scheduled to be in service by the end of this year.

American military forces and its F.A.A. clearance is imminent.

The remarkable thing about the remainder of the range, of which all except two or three smaller Continental designs employ the twin rear-engine configuration and are generally similar, is that most are scheduled for prototype completion during 1962 and for marketing during the following year. This would seem to indicate that a large and lucrative market exists for the small executive jet, and this is clearly the thought of some very reputable international manufacturers.

In the United States alone, there are in the region of 7,000 multi-engined aircraft in the current general aviation fleet; but official U.S. estimates consider that no more than 200 jet types will be in corporate service out of 105,000 non-commercial aircraft expected in America by 1970. Morane-Saulnier based the development of its executive jet designs on a possible market for at least 100, but it is clear from the present scramble for production, that competition will be unusually keen.

Our own de Havilland company is laying down an initial production batch of 30 D.H. 125s, which presumably brings the project past its break-even point. As one of several similar designs developed specifically for executive requirements, the D.H. 125 may almost certainly be regarded as the subject of some military interest, and it is significant that about 50% of the other comparable projects have a non-civil background. This presumably accounts for the absence from the jet field of the biggest producers, in terms of numbers, of business flying aircraft, including the Big Three in the United States—Beech, Cessna and Piper.

Cessna, in fact, has a project for a four-seat adaptation of its T-37 trainer, the Model 407, but this seems to have been referred back to longer term development. There are other reasons, of course, for the absence of these manufacturers from the executive jet field. Their commercial investment and experience are in a very different class of aircraft since it would seem more appropriate to regard the business flying jet as a scaled-down airliner rather than a direct development of current executive types.

This is why de Havilland, Douglas and Lockheed figure prominently in any review of corporate jets, which also bring business flying costs into a new and rarified stratum that hitherto has been the prerogative of purely commercial types. Since the essence of executive operations is time-saving and increased productivity, there seems to be no doubt that the heavy additional expenditure will be acceptable to many of the great international industrial organizations.

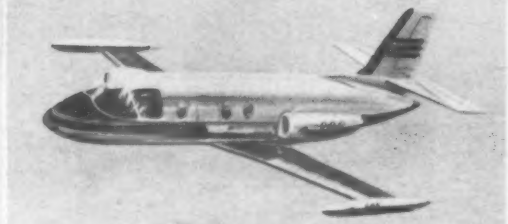
Small Jets Analysed

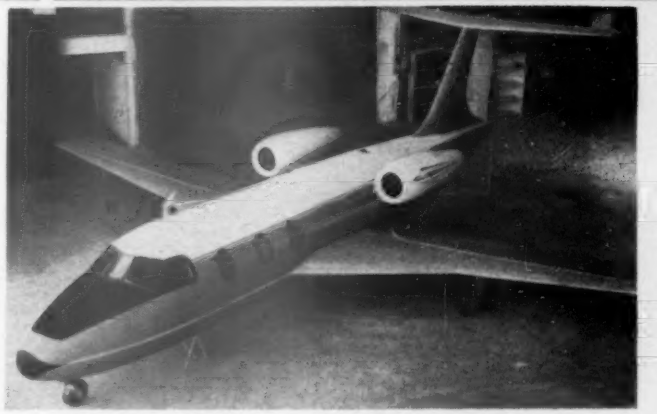
A limited requirement for a small four/five-seat twin-jet aircraft appears to exist in the relatively low-cost bracket. Some idea of the market size is indicated by the sale of about a dozen of the Morane-Saulnier Paris I and II for civil use since 1958, out of total production of some 140. During that time, the Paris has had the jet executive market more or less to itself, but its appeal has been limited by its cockpit-type accommodation, with access by a ladder, and generally limited room. A change from the military environment was made with the introduction of the five-seat Paris III, at the last Paris Aero Show in May this year, with cabin accommodation.

The M.S. 760C Paris III differs from the Marboré VI-powered Mk. II only by the new faired canopy and revised seating. Individual bench seats are situated behind the pilots, and a fifth folding seat is placed in the centre of the original baggage compartment.

Access to the cabin is via a port door, the sill of which is close to the ground for easy entry. Normal pressurization of 5 p.s.i. gives an 8,500 ft. cabin altitude at 25,000 ft., and the Paris III has engine de-icing, plus provision for airframe de-icing. Morane also had a project for a seven-seat rear-engined executive twin-jet, the M.S.861, with two Pratt & Whitney JT12-A3s, to sell at $500,000, but the company appears to have become disenchanted with its prospects after its market survey.

Aircraft	Powerplant	Normal seats
BRITAIN—de Havilland D.H. 125	2 x 3,000 lb. B-S Viper 20	8
FRANCE—Morane-Saulnier Paris III	2 x 1,060 lb. Turbomeca Marboré 6	5
GERMANY—Potez-Heinkel CM 191	2 x 1,060 lb. Turbomeca Marboré 6	4
ISRAEL—Israel Aircraft B-101C	2 x 2,400 lb. GE CJ610-2B	7/8
ITALY—Piaggio-Douglas PD-808	2 x 2,850 lb. GE CJ610-1	7
SPAIN—Hispano Aviacion HA-230	2 x 1,543 lb. Turbomeca Aubisque	6
SWEDEN—SAAB-105	2 x 1,543 lb. Turbomeca Aubisque	4/5
SWITZERLAND—SAAC-23	2 x 2,400 lb. GE CJ610-2B	8
U.S.A.—Aero Commander 1121	2 x 2,850 lb. GE CJ610-1	6
Lockheed CL-329 JetStar	4 x 3,000 lb. P & W JT12A-6	10
North American NA 265	2 x 3,000 lb. P & W JT12A-6	6





VARIATIONS ON A THEME—I.—The cult of twin rear-engined executive jets as currently represented by (left to right), the D.H. 125, Aero Commander 1121, SAAC-23, Piaggio-Douglas PD-808, North American NA-265 (T-39A), and Israeli B-101-C.

Even the future of the Paris III appears by no means certain, which also seems to be the case with a very similar Spanish project, the Hispano Aviacion HA-56 or HA-230. Like the Paris III, the HA-230 has a new nose, grafted on to the twin-jet airframe of the HA-200 Saeta military jet trainer. Replacement of the original 880-lb. Marboré II turbojets by two of the new Turbomeca Aubisque ducted-fan engines, each developing 1,540 lb. thrust for take-off, with flank intakes, has given the HA-230 a six-seat capacity.

The cabin is pressurized to 9,000 ft. at 36,000 ft., and has emergency oxygen. A medium-pressure hydraulic system is used for operation of the undercarriage, wheel brakes, flaps and air brakes. The HA-230 has provision for all normal radio and equipment, including wing and engine de-icing.

Yet another conversion from a military trainer is the four-seat Potez-Heinkel CM191, which is a Franco-German project based on the well-tried Fouga Magister. With the operating experience of about 700 Magisters behind it, the CM191, which is simply a four-seat adaptation with higher-powered Marborés, suffers from the same limitations for executive use as the Paris I and II, but should be a reliable and economical proposition for many specialized jobs. The prototype, which was shown at Paris earlier this year, began its flight test programme in Germany a few weeks ago, and delivery was scheduled for 1962.

A joint military-civil rôle is envisaged by the Swedes for the SAAB 105, which although aimed primarily at the training market for the Swedish and other air forces, is projected in an executive version. In this, a rear bench seating up to three behind the pilots replaces some of the military equipment. Apart from its limited accommodation, the SAAB 105, with its economical Aubisque by-pass turbofans and good cruising and short-field performance, is an attractive executive proposition. Its prototype is scheduled for completion late next year.

Completing the survey of twin-jet trainer conversions is a design study by Aeronautica Macchi based on the M.B. 326 Viper-powered trainer and designated the M.B. 330. With the same wings, undercarriage, tail unit and control system, as the 326, the M.B. 330 will be powered by two Turbomeca Aubisque turbofans and have a designed cruising speed of 466 m.p.h. over 1,550 miles. It will carry six passengers in a pressurized cabin and cost $220-250 thousand for a production run of 50 aircraft.

Big Business Jets

One of the main shortcomings of the four/five-seater executive jet which has proved to be of surprising importance in the equivalent piston-engined field is that provision for toilet facilities is difficult. Although journey times are likely to be halved in the new generation of 500 m.p.h. aircraft, toilets are still considered to be essential for executive operations. This provision, in fact, dictates to a large extent the main configuration of the cabin, which in its optimum size appears to need accommodation for about six persons with a high degree of comfort.

Most of the large business jets are capable of carrying rather more people if required, but this is not likely to be often since apart from any other factor, most companies do not favour more than three or four of their senior personnel flying together in one aircraft. Insurance problems might otherwise arise, apart from the "all eggs in one basket" aspect.

Even the largest of the executive jets, and the first to enter service, Lockheed's scintillating JetStar, regards eight passengers as a comfortable maximum for its twin cabin layout, and among the numerous "custom" interiors is one for three. This enables full use to be made of the JetStar's particularly long range capabilities with flight times approaching six hours, by furnishing the forward cabin with two full-size beds.

The era of pure-jet business flying was ushered in during September, this year, with the first civil deliveries of the JetStar after its FAA certification to CAR 4b. The JetStar originated from the 1956 UCX specification from the U.S.A.F. for a high-speed, long-range (435 knots/1,500 n. miles) light jet transport to carry 10 passengers and a crew of two. In the absence of suitable American powerplants, the prototype CL-329 first flew, as a scaled-down version of the Lockheed L-193 rear-engined transport project, on Sept. 4, 1957, with two 4,850-lb. Orpheus (TJ37-A1) turbojets.

So impressed were Lockheed with this engine that all JetStars from the No. 2 aircraft, were given Orpheus capability as an alternative to the four later Pratt & Whitney JT12s. Because of its better engine-out performance, however, the four-jet version has become virtually standard, and is in both civil and military production. As the C-140, 11 JetStars have been ordered by the U.S.A.F. and two by the U.S. Navy.

Seven JetStars are currently being delivered to American companies and 18 in all are scheduled to be in corporate service by the end of this year. Orders have been placed from governmental agencies and business firms in Canada, Italy and Germany, apart from the U.S. and the $1.3 million price-tag, without electronics or furnishings, is clearly little deterrent to World-wide sales.

The first JetStar to reach Europe will be for Krupp's of

Span	Length	Height	Wing area	Cabin			Empty weight	Gross weight	Cruise performance					Initial climb		Service ceiling		T.o. to 50 ft.	Ldg. from 50 ft.	Est. basic cost
				Length	Width	Height			Speed	Height	Range	Fuel	Payload	A	B	A	B			
ft. in.	ft. in.	ft. in.	sq. ft.	ft. in.	ft. in.	ft. in.	lb.	lb.	m.p.h.	ft.	miles	Imp.gal.	lb.	ft./min.	ft./min.	ft.	ft.	ft.	ft.	
44 0	43 6	14 0	342	18 6	5 10	5 9	—	18,000	500	—	1,500	—	—	—	—	—	—	—	—	—
33 2	33 0	8 6	194	—	4 3	—	5,500	8,600	400	25,000	1,082	403	—	2,560	300*	32,800	—	3,700	—	$300,000
39 5	32 7	10 6	202.6	5 8	3 9	—	4,865	9,405	385	20,000	1,318†	3,362‡	1,178	2,450	616	35,760	—	4,280	—	$230,000
40 4	36 11	15 10	239	—	—	—	6,505	12,500	450	32,800	1,650	—	—	5,900	—	—	—	2,625§	3,500	$350,000
40 8	39 6	14 9	225	12 4	5 4	4 11	7,500	15,000	520	40,000	2,000	695	2,000	7,440	2,375	46,700	28,900	2,770	2,300	$500,000
35 8	31 8	10 0	195.8	—	—	—	3,858	8,378	420	30,000	1,600	416	—	2,500	—	—	—	2,200§	1,660§	—
31 2	34 5	8 10	175	—	4 2	—	4,440	7,700	400	36,000	1,450	310	—	4,720	1,550	43,200	25,000	3,350	3 180	$210,000
34 7	39 3	10 10	215	—	5 3	5 7	5,262	11,700	500	30,000	1,000	—	1,450	6,000	2,000	—	20,200	—	1,700§	$250,000
43 4	48 0	14 9	303	8 6	4 9	5 0	7,000	14,000	500	35,000	1,700	790	900	7,000	2,200	40,000	25,000	2,129	1,377	$475,000
53 8	60 5	20 6	542.5	28 2	6 8	6 2	20,030	40,921	495	35,000	3,050	2,189	1,640	3,500	—	45,000	—	4,460§	2,525	$1,350,000
44 6	44 0	16 0	342.1	15 10	5 2	4 8	8,152	17,760	452	40,000	1,660	878	1,800	3,860	—	39,000	17,500	3,690	3,100	$800,000

A—All engines operative. B—One engine inoperative. *—At 5,000 ft. †—At 30,000 ft. ‡—Pounds. §—Ground run.

Essen, and will be handled, together with others as they arrive, by Weser Flugzeugbau at Bremen. Among the design features are an ultimate design pressure of 19 p.s.i. in the fuselage—or double that required to maintain cabin altitude at 8,000 ft. during operations at 45,000 ft.—and the use of safety glass in the passenger windows as well as in the cockpit to avoid the risk of explosive decompression.

The JT12s are fitted with thrust reversers, and as further aids to short-field performance, the JetStar has hydraulically actuated leading-edge flaps drooped 27° in conjunction with the normal trailing-edge flaps. An unusual feature is the pivoting of the entire tail assembly about the fin for longitudinal trim. Hydraulic boost is provided for ailerons and elevators, and the 500 U.S.-gallon pinion tanks form a permanent part of the airframe.

Something like the JetStar brings New York within two hours of Miami, and less than five from Los Angeles. Its appeal is shared by the tough little North American Sabreliner, which, as the winner of the U.S.A.F. UTX competition, also in 1956, for a combat readiness trainer and utility aircraft, has the considerable advantage over competing types in the executive field of an assured and substantial production run. Ninety-four Sabreliners have currently been ordered, including 88 T-39A utility crew trainers, and six T-39B tactical systems trainers with the NASARR weapons electronics of the Republic F-105D.

Although the T-39 was required to be certificated to CAR 4b and SR 422B for civil transports by the U.S.A.F., and has completed its tests to these requirements, North American has still not decided whether to continue development of its business flying variant, the NA 265. The T-39 gave impressive proof of its structural integrity and handling qualities by its rapid rolls during the 1961 Paris Salon, but some of its detail design departs from executive standards.

Cabin accommodation, for the military rôle, offers rather less space than in comparable executive designs, particularly in lack of headroom, and airframe de-icing is not specified by the U.S.A.F. Some reduction in fuel or payload may also be necessary to meet civil runway requirements for full temperature accountability. It will be noted from the tabulated data that executive aircraft payloads form a very low proportion of the max. gross weight, so that it is nearly always possible to combine a full fuel and passenger load.

While the prospects of the NA 265 remain, at the moment, in doubt, other similar American ventures are more positive. Aero Commander's 1121 Jet is one of the few new projects for which a firm price (of $475,000 without electronics) is stated, and its manufacturers are sufficiently confident to offer customers interest on their initial $25,000 deposit. The Model 1121 Jet Commander prototype is due to fly next May; certification is expected by the end of 1962 and orders are now being accepted for delivery by the third quarter of 1963. Fully equipped price will be in the region of $555,000, according to Field Aircraft Services, the U.K. distributors.

Aero Commander has aimed at producing a 500-m.p.h. business aeroplane with an adequate range, but capable of using airstrips very little bigger than those currently used. The 1121 is designed to operate at its full gross weight of 14,000 lb. from minimum runway lengths of 3,000 ft. up to altitudes of 5,000 ft. and OATs of 85° F. Normal cabin complement is four persons, and pressurization is provided to 7.5 p.s.i. (8,000 ft. at 35,250 ft.).

Design load factors are +5 and −3 at max. gross weight. Unlike most of its competitors, the 1121 has no separate air brakes, the main legs of the tricycle gear being designed for independent operation up to 250 knots I.A.S. Like the NA 265, the 1121 has unboosted flying controls. Lavatory, small galley, wash basin, water stowage and waste disposal space are standard. Automatically ejected oxygen masks are provided over each passenger seat and in the toilet, in the event of pressure failure.

The Piaggio-Douglas PD-808, which is also scheduled for delivery in 1963, is comparably priced at less than $450,000. With up to 10-seat capacity, the PD-808 has been designed by Douglas but will be manufactured in Italy, at least initially. It will also be marketed by Douglas in most parts of the World, and is designed for conversion to cargo, ambulance, training and military rôles. The Italian Air Force has an interest in the PD-808 project.

With its two CJ610 turbojets or Bristol Siddeley Viper 20s, it falls very much in the pattern and price category of its contemporaries, including the D.H. 125, which is also due to fly next year, probably in April. Like all these transports, a very short flight development phase is foreseen for the D.H. 125, which is to be available for delivery by 1963.

In the executive field, the D.H. 125 may well score on its cabin volume, particularly in available headroom, which enables most people to stand upright. With six comfortable individual seats, space is available for baggage, galley and toilet compartments. Great attention has been paid to low-speed handling, to combine a 500-m.p.h. cruising speed with short-field capability.

VARIATIONS ON A THEME—II.—Executive projects derived from military trainers include (top to bottom), the Hispano HA-230, Morane-Saulnier M.S.760C Paris III, Potez-Heinkel CM 191 and Saab 105.

Of the remaining two executive jets reviewed, the Swiss-American SAAC-23 and the Israeli B-101C, their common feature, apart from design layout, is a below-average basic price. Of the $250,000 SAAC-23 ($350,000 equipped), its sponsor, the redoubtable William Lear, Sr., is reported to have said recently, "Don't take any bets that it can't be produced at those prices, because you'll lose." Next April is the target date for the first flight of the prototype, which is being built in Switzerland by Flugzeugentwicklung A.G., at St. Gallen. Production is planned to be shared between that company and the Swiss-American Aviation Corp. of Delaware.

The Israeli Aircraft Industries' B-101C project evolved from the smaller J69-powered B-101B, and wind-tunnel testing began in France earlier this year. It is interesting in using almost a crescent wing plan, and two prototypes should fly in 1963. A larger development, the B-101-K, with two 4,300-lb. G.E. CF-700 turbofans as an alternative to its CJ610s, has been mooted, with an increase in gross weight to 16,000 lb., but its details are apparently not yet finalized.

Turbofans are coming into the fashion for executive jets, as well as for their larger airline brethren, and they might well be what the well-dressed business aeroplane will be wearing in, say, 1965. On the other hand, they could well be earlier, but whatever form of jet power is used, the race is well and truly on.—JOHN FRICKER.

Air Transport . . . .

A Regional Approach to Route Rights

by J. W. S. Brancker

IT is certainly easier to criticize than to construct—and premature criticism can often rebound with damage to the critic—but the workings of the Air Transport Licensing Board, to date, have disclosed two particular weaknesses which, unless corrected, may vitiate most of its usefulness.

These comments are certainly not levelled at Professor Jack and his merry men, who have gallantly sat through the most tedious and difficult hearings and have shown commendable patience, intelligence and common sense in a situation which seems to be most accurately represented by the statue showing Laocoon having trouble with a number of snakes. But their task is not made easier by the basic deficiences of the Act which, by reflecting the usual political pusillanimity, is encouraging decisions which are quite contrary to good transport practice.

The first absurdity concerns the idea of "material diversion." Not only is "material diversion" almost impossible of definition in the clearest circumstances, but, when projected into the future, becomes even more vague. Can there, in fact, be "material diversion" from traffic which has only been estimated but not yet carried? This interesting but somewhat amorphous phrase first gained air transport currency with the establishment of the A.T.A.C.—a basically non-legal device used primarily for the purpose of trying to fulfil political promises without bothering to enact the legislation necessary to remove the monopoly entitlements of the Corporations.

It was very rightly pointed out recently that the A.T.A.C. only worked (if work is the right word) because of the great personality and common sense of Lord Terrington; but the concept itself was wrong. The new legislation setting up the A.T.L.B. has gone at least far enough to make the processes legal, but it is still not clear whether the whole affair is an honest attempt to give the independents a viable and permanent share of British air transport, or whether it is closer to being a political gesture designed to pay lip service to a declared policy, but not intended to make much difference in fact. So long as those words—"material diversion"—are to govern the outcome one cannot help feeling that the real intention is to avoid rocking the boat, but—and this is the real trouble—the overall pattern which may emerge will not be a good one from a material point of view.

Share of a Share

According to the present ground rules, any carrier who can obtain an air operator's certificate is free to apply for a permit to run regular services over any route, regardless of whether the route in question is already being served by a British operator. Quite naturally the existing operator, usually one of the Corporations, springs forward with the objection that it will cause "material diversion" and the Board is left with the unenviable task of trying to decide not only what "material diversion" really means today, but what it may be expected to mean in 1963 and thereafter.

In most of the applications which have been heard to date the Corporations have made great play about the difficulties they have experienced in relation to existing bilateral agreements and have insisted that, because of foreign restrictions, any new capacity offered must form part of the British share and therefore represents a deduction from their own capacity, whether actual or planned, and consequently a direct loss of revenue. All have quoted their estimated loss in terms of gross revenue and have omitted the sordid fact that it costs a good deal of money to earn it, and that the ultimate result may be a small profit—or, indeed, a net loss. But, regardless of the slightly slanted descriptions of bilateral restraints, the fact remains that few foreign countries, if any, will be ready to see British air carriers take too large a share of the traffic available and will certainly not welcome an increase in British capacity.

It is not inconceivable that decisions taken by the A.T.L.B. will be frustrated by the action of foreign governments—action taken either within the terms of some agreements or by the insistence on new terms to suit their requirements. Bilateral agreements, when revised, usually have the unpleasant habit of turning out to be more restrictive than more liberal—even if new routes are squeezed into the annex.

However, even if the intergovernment problems can be settled satisfactorily and we assume that, in its wisdom, and blocking its collective ears to the bleating of the Corporations, the Board does allocate a number of routes to new applicants, all, in fact, it will have done is to permit carriers to set up a network of wide-ranging spidery and relatively infrequent services, and to ensure that there will be at least three carriers (two British and one foreign) in competition. It is exactly this situation which is unsound from the aspect of transport economics.

It is always wise to learn from the experience of others and there is a first-class object lesson in the United States. So long as the C.A.B. resisted outside pressures, and kept the number of competing carriers over trunk routes to two, progress was rapid, and economics remained sound; as soon as it forgot its first principles and permitted a larger number of carriers to operate over more sectors (in the sacred name of competition) the economic situation softened and most of the carriers moved into the red or dangerously near it. It is faintly entertaining to see the C.A.B. now shedding unhappy tears about the number of carriers on the North Atlantic, when it has in fact failed to prevent the same situation arising in the United States where it has had the power to do so.

Long-term Participation

The unfortunate thing is that this is exactly the situation which is being promoted by the Act. What, in fact, does the Government want? If it really does want genuine long-term participation by the independents then it must have the courage of its convictions and bring them in, in such a fashion that they can perform a useful function, and not merely survive as a series of thorns in the flesh of the Corporations. The only sensible basis is a geographical one. There is probably nothing wrong in dealing with I.T. charter applications without strict geographical limits, because tourist habits change and these services meet a demand for a type of transport which is not always provided by regular services; but, even in this context, there is a good case for permitting the designated carrier to develop all varieties of traffic in his allotted area—provided he does it well. While division by class of traffic handled may have proved a useful political expedient and did, in fact, serve as a basis on which the A.T.A.C. was able to recommend associate agreements, it becomes immediately impractical when designation is sought for a route where all classes of traffic are already being carried by an existing operator.

The notion of giving the independents a share of the traffic by allocating to them prime British rights over certain new or existing routes is unlikely to find very much more favour with the Corporations than the present scheme. The Corporations, of course, will protest if anything is taken away from them—regardless of whether it is done by nibbling away at a number of routes or by leaving most routes undisturbed and taking away some altogether—and they are not really to be blamed for this attitude.

In this article I am not saying that anything must be taken away, but only suggesting that if this is what the Government wants to do, then it should do it as cleanly and as efficiently as possible.

Let us be quite clear that neither B.E.A. nor B.O.A.C. deserve to have their activities reduced. B.E.A., in particular, has served the country well, and B.O.A.C., in spite of being somewhat fat and expensive, has not much to be ashamed of. But we are not talking about deserts; if complete justice were suddenly done, and all previous actions, whether good, bad or indifferent, were correctly rewarded, the air transport picture, among many, would be very different. We are really talking about the best method of executing an expressed Government policy.

During the A.T.L.B. hearings great stress has also been laid by the Corporations on the pioneering and development work which they have done and the injustice which would be caused by letting someone else reap the benefits. These statements would be a great deal more moving if the Corporations were commercial organizations in which a small but loyal group of shareholders had taken financial risks and losses in the expectancy of an ultimate profit. They would also be more true

if there had been greater continuity of board membership and management.

In fact, much of the development work was done by people who, for various reasons, are no longer with them and quite a number of the taxpayers, whose indirect contributions to previous losses made pioneering possible, have since died. In this particular case the stockholders—i.e., the general public, represented by the Government—appear to have decided to allow other organizations to take over part of the contract and, if that is really what the owners want, the Corporations, *per se*, have a bad case. This reasoning has nothing to do with safeguarding the rights of the staff employed—which is quite a different matter and must be observed whatever the outcome.

Would geographic curtailment really prove so discomforting to the Corporations? Looked at purely from the aspect of public accounts—i.e., the profit or loss which is likely to accrue from the national investment—the answer is probably "no"—within certain limits. Once a certain size has been reached the savings in operating expenses due to a large network are minuscular. Reduced costs are much more likely to be found in the full exploitation of "thicker" routes and widespread operations over a very large geographical area do not help this concept. I appreciate the necessity for including in any network a sufficient number of more lucrative routes to make the whole self-supporting, but the present concept, which may well permit competition between two British carriers on any number of services, may also destroy the benefits of the "thick" sectors.

A U.S.A. Parallel

It is significant that the United States' transcontinental carriers manage to survive without operating to Miami and B.E.A. has not done badly in Europe without any long-distance services at all—except for an apparently irresistible attraction towards that fascinating, unstable and greatly over-supplied area known as the Middle East. A degree of contraction and concentration might well result in the better exploitation of the remaining market.

If the Government really means what it says, such a policy could be put into effect without disaster. It would be competitively unsound to separate the Atlantic and Eastern operations of B.O.A.C., as this would interfere with round-the-World services, but apart from an overlap at the European end which must exist to a greater or lesser degree, there is no reason why services to Africa should not be treated quite separately and handed over to the independents for their delectation and development. The same thing can be said about services to South America.

The situation in Europe is rather more complex, but, if we draw a line roughly from London to Istanbul, it would be possible to say that services to all points north-east of that line were the prerogative of the independents. The process need not be so drastic, but it serves to illustrate the principle. For the sake of the bilateral agreements it would be wise for countries to be treated as a whole and each should be served only by one British carrier. A division on these lines would not be a one-sided arrangement; B.E.A. would be free from molestation in its operations to points to the south-west of such a line—except for a controlled number of I.T. charter operations to move traffic for which they were unable to cater.

The chief objection to such a policy is that it would involve an immediate and plainly visible reduction in the activities of the Corporations; alternatively, a slow infiltration on a wide front is more likely to curtail the future rate of growth than to produce any immediate changes. The latter process is less painful in the first instance, but will probably lead to a very much longer period of uncertainty and instability, and will certainly lead to a less efficient operational pattern. While it is possible to organize a complete transfer of staff and equipment, it is very much harder to reduce a route organization to compensate for the carriage of a smaller share of the gross traffic, so that, apart from the bilateral troubles which have already been mentioned, a policy of infiltration may ultimately yield inferior economic results for quite another reason.

There is a second point in which the Act is basically deficient, and which is closely allied to the policy of infiltration without geographical limits. Because the watchword is "material diversion" the emphasis is almost entirely on the maximum frequency and capacity which may be offered by the applicant for a regular service licence.

This is natural if existing operators are to be protected, but fundamentally this type of restraint has no real virtue and is certain to cause a high degree of frustration to all parties, not least the passenger. What is really required in setting conditions for a licence of this kind is a guaranteed minimum frequency and capacity with the clear understanding that the applicant will automatically lose his licence unless he provides it—or unless he receives special exemption from the Board to meet unforeseen circumstances.

Such a condition would have two direct advantages. It would have an immediate effect on the type of application received. There is a great difference between asking for a certain frequency on a regular service, with the thought in mind that it need never be operated unless justified by the traffic actually carried in practice, and knowing that the frequency requested must be produced, come hell or high water. In many of the present applications it is apparent that the frequency and capacity chosen are the greatest which the applicant thinks he may ever have to use and there is probably an additional element included to compensate for reductions imposed by the Board itself.

Minimum frequency requirements will ensure not only that all applications are serious, but that traffic estimates are not strategically exaggerated. So long as the Government feels that the independents should be allowed to compete with the Corporations, but should not be allowed to hurt them (a slight contradiction in terms), there must presumably be limits set on this competition, but, without this artificial necessity, payload factors and economic results are sufficiently stern taskmasters to keep capacity at the right level, even if it takes a little time to learn the lesson—as shown on the North Atlantic.

There is another practical reason for insisting on the inclusion of minimum frequencies and capacities. Without such figures it is quite impossible for the Board to know how much British capacity is really going to be made available on any given route. This knowledge is not only essential for forward planning and to handle further applications, but must also be available in the light of future bilateral discussions. If traffic exceeds expectations, and every carrier on the route finds that he must generate more capacity, everyone is happy and no harm is done, but, even in bilateral agreements where there is no question of predetermination, the U.K. negotiators must at least know what they are trying to obtain.

There is probably a good case for putting frequency limits on the series of charters operated for inclusive tours. These are essentially flights required for a special purpose and should not be allowed to spread to fields beyond this purpose.

All these remarks are, of course, predicted on the assumption that the Government really does want the independents to play a permanent and worth-while part in British air transport. It appears that the present trend is unlikely to reach a very satisfactory solution and it might be wiser to chart a new course before too much harm is done and before a series of difficult bilateral discussions are started.

LUTON VISITOR.—The first K.L.M. Viscount to divert to Luton Airport following the airline's decision to use this municipally owned airfield as its No. 1 diversion for London (see our issue for Nov. 2) is seen here in front of the control tower on Oct. 30.

Air Transport . . . .

Rationalization in Mexico

THE long deteriorating situation of the three Mexican airlines—Mexicana, Guest Aerovias and Aeronaves—has worsened in the past two months. Their extreme economic plight (see our issue of Oct. 5, pp. 442-443) has been brought further into the light of day by Mexicana's default on the September payment to de Havillands for the Comets, on which something like £4 million is still outstanding.

The Mexican Government has a plan for pooling aircraft. It is not intended (as recent reports in *Time* have suggested) that the three companies should merge, but that they should retain, as hitherto, their financial and administrative independence. The pooling plan proposes a fund of U.S. $24 million, of which 50% is to be contributed by the Government, with U.S. $4 million from each of the three companies. Having held back when Boeing 707s could be had cheaply, the Government is believed to wish for a return to DC-8 operation on international services. It will be remembered that Aeronaves' venture with this type was concluded when a DC-8 crashed on take-off from New York within a few weeks of inauguration of the turbojet service.

The major problems confronting Mexican civil aviation are labour demands (with the Government persistently taking labour's side); too few passengers (because the service is often so bad and domestic passengers are so weary of the DC-3); too much capacity (because, where DC-3s have been stood down, DC-6s, through lack of anything else, are being used); low tariffs (because the Government insists on these being held to old levels); and expensive fuel (because the Government insists on maintaining what the airlines claim to be an unfair rate of tax).

Mexicana reports contentedly on its Comet operations, but points out that these cannot make up for the losses from obsolete and unsatisfactory piston-engined operations. The company has paid no dividend since 1956 and returned a loss of $479,000 in 1960. It is forecasting a heavier loss for this year. De Havilland and Hawker Siddeley representatives have recently been in Mexico City to make new financial arrangements. It is reported that a new agreement has been reached which provides the necessary guarantees from the Government Finance Agency.

Guest Aerovias was recently acquired by the Mexican financier, Carlos Trouet—reportedly for about U.S. $1 million—and there has been speculation locally whether this was a display of his customary astuteness or of some unexpected aberration.

Aeronaves is operating under great difficulties and losing substantial sums. Wishing to get into turbojet operation again on the Mexico-New York run after the crash of their first DC-8, this operator is offering for sale its three Britannia 302s with spare engines, spares and full ground equipment as a package deal.

OPtional Reading—21

CONTINUING with the cross-check on my table of Nov. 9, and to underline my remarks of last week to the effect that the slow, flat approaches of the 1950s are still causing accidents in the 1960s, let us look at the Electra crash at La Guardia on Sept. 14, 1960. This appears to be a carbon copy of the Singapore accident, a flat approach over a sea wall in windy conditions; about the only differences are that the aircraft hit the wall itself and the 76 persons on board got away with only minor injuries.

The first useful check is that the wind, as quoted in the C.A.B. report, was given as 18 kt., gusting to 24 kt. This ties in almost exactly with our assumption of gust effect being 0.34 times the mean wind.

The second useful check is that, according to the report, the operating manual recommended an airspeed over the airport boundary of 119 kt. for an Electra weighing approximately 90,000 lb: I do not have the manual from which to check the stalling speed, but I happen to have a spot figure that at 95,700 lb. the full flap (39 deg.) figure is 93 kt.; so at 90,000 lb. it would be about 91 kt. Now 91 x 1.3 is 118.3, which is near enough to 119 and makes it clear that the operating manual instructions for threshold speed were based on the 1.3Vs formula. The actual pre-threshold flap setting is given as 36 deg. and speed as 120 kt.; this and eye-witness reports of the final flight path indicate that the approach could fairly be described as "low but legal."

Incidentally, it would be very helpful if future inquiry boards would give the relevant stalling speed figures so as to permit a thorough examination of the facts. To date, however, I do not recall an accident report in which the basis of the performance certification was ever challenged—certainly there is no evidence that it was in the three accidents under review. As I said last week, "many of the accident and incident investigations show so much preoccupation with the visual aspects of the landing that they give no clue to approach speeds. . . ." The pilots at both Singapore and La Guardia could see the sea wall in front of them all right; there was no visual problem at all; but, in the words of the report on the latter, "in the last few seconds a downdraught was encountered and the aircraft sank perceptibly . . . just before reaching the dyke his airspeed dropped slightly, accompanied by a mushing feeling."

I am not surprised. Assuming 0.2*g* for the round-out to clear the dyke, adding 1 kt. to the full-flap stalling speed (since flaps were at 36 and not 39 deg.) and 4 kt. for stall mismeasurement, taking the buffet at stall plus 5 kt., crediting 10% (9 kt.) for slipstream effects and using the methods previously described, the probability of getting into trouble (meeting buffet or sink) comes to 10^{-2}. Even if one assumes no stall mismeasurement, the figure is only marginally safer than the rock bottom standard of 10^{-4} (actually 4×10^{-5}). But again I would make it clear that I am not saying that there was no pilot error in this accident: the pilot admitted to an intention to land short (as at Singapore, he was trying to clear the runway quickly for the benefit of a following aircraft). What I am saying is that not only should the approach heights have been examined by the investigating authority; the approach *speeds* should also have been examined since, for any guidance which the operations manual appears to have given, the pilot was flying at a safe speed, while actually he was flying at an unsafe one. And, if this had been clearly said at Singapore, La Guardia and other undershoots involving slow, flat approaches would probably not have occurred.

Anyway, it has been said now. As deduced from my table of Nov. 9, and as cross-checked against two cases (chosen mainly because I could get the figures), under existing methods of certification approaches at 1.3Vs are unsafe in any but calm conditions.

Turning now to the Nairobi 707 case (Oct. 29, 1960), we have a somewhat different condition, in which the account indicates a fairly steep descent, with the pilot applying more and more power to arrest it but not quite succeeding. From the report there is a substantial amount of evidence of a high rate of descent from the outer locator, followed by successive increases in throttle opening to arrest the rate of descent and, finally, a pull up on the nose as soon as the lights were seen ahead. The evidence varies a little according to source, but, in the words of the captain: "I was able to actually think along those (i.e. stay VMC) lines—advance the throttles, check slightly on the elevators, and also I noted that I would have to turn slightly more to the right-hand side if I wished to intercept the centreline. . . ."

One of the reasons why I picked on this accident is that the above description, plus a light wind (quoted as 3-5 kt.), might permit us to look at our method of analysis on the basis of a predominant *g* effect, with little contribution from the wind. Unfortunately, no accelerometer appears to have been carried—at least there is no mention of it—and so it is difficult to assign a *g* loading with any degree of confidence. However, these points should be remembered: the rate of descent was sufficiently high for the first officer to give a call every 50 ft. instead of the usual 100; from the above remark of the captain, a slight turn may have been initiated, adding to the round-out *g* force; the *true* airspeed (indicated as 145 kt.) at the height of Nairobi (5,300 ft.) would be higher than on the normal circuit at, say, 1,500 ft.—so the *g* loads on both round-out and turn would be higher. In the circumstances an assumption of 0.3*g* and a buffet or high sink rate at (Vs) stall plus 10 does not seem unreasonable and gives a probability of an incident at 3×10^{-5}; if one assumes 0.35*g*, then it comes out at 1.3×10^{-3}. One is borderline, the other in the danger zone.

This seems to indicate that the method copes more easily when winds are dominant; but it becomes rather uncertain in the light-wind case unless one has flight recorder giving the acceleration.

Incidentally, I gather that 707 pilots at Nairobi have lately adopted the practice of carrying additional indicated airspeed on the approach. Could this be the intuitive compensation for higher manœuvring *g* than one would suspect from a look at the A.S.I.?—C.C.J.

The Fighting Services

Air Staff Appointment

AIR MARSHAL SIR WALTER G. CHESHIRE, K.C.B., C.B.E., is to become Air Member for Personnel next month in succession to Air Marshal Sir Arthur McDonald, K.C.B., A.F.C., who is to relinquish his appointment for health reasons.

A.O.C., Malta, and Deputy C.-in-C. (Air), Allied Forces Mediterranean, since May, 1959, Air Marshal Sir Walter Cheshire was previously R.A.F. Instructor at the Imperial Defence College. Prior to that he was successively Air Officer in charge of Administration, 2nd T.A.F., and A.O.C., No. 13 Group, Fighter Command.

Air Marshal Sir Arthur McDonald was appointed Air Member for Personnel on Oct. 1, 1959. Before that he was A.O.C.-in-C., Technical Training Command.

Groves Memorial Prizes

FOUR officers and senior N.C.O.s and one Air Ministry meteorologist have won the 1961 L. G. Groves Memorial Prizes and Awards.

For the first time, the Flight Safety Prize is shared. The two winners are S.Tech. L. Hodgkinson and Sgt. H. S. Carden, both stationed at R.A.F. Honington, who have devised a test set for checking the operative parts of an aircraft fire-extinguisher circuit. Although the device has been designed for use on the Victor, the basic principles can be applied to other types.

The Meteorology Prize goes to Mr. E. Knighting, an Assistant Director of the Meteorological Office at Bracknell. He was a member of the team which developed the techniques of upper-air analysis and forecasting from the network of upper-air temperature and wind observations which have contributed much to upper-wind forecasting.

The Air Meteorological Observers Award goes to Flt. Lt. R. J. K. Nicholas of No. 202 Squadron, R.A.F. Aldergrove, who, as a Hastings captain engaged on meteorological reconnaissance duties, has completed 180 reconnaissance flights of which 43—involving 388 flying hours—have been made in the past 12 months. Recipient of the second Memorial Prize is Sqn. Ldr. J. N. Robertson, formerly based at R.A.F. Wattisham and now at R.A.F. Middleton St. George. He has designed a computer which provides a fighter pilot with a quick, simple and effective means of calculating the magnetic track and distance from his base or diversion airfield.

Operation "Sky Help"

CONTROLLED by an Air Transport Operations Centre provided by No. 38 Group, Transport Command, R.A.F. aircraft have been operating at maximum intensity on an airlift between Palisadoes Airport, Kingston, Jamaica, and the devastated city of Belize, British Honduras.

Service aid started on Nov. 1 when two Shackletons of No. 42 Squadron (Wg. Cdr. H. Mansell) left St. Mawgan for Kingston, by way of the Azores and Bermuda, where they were positioned ready for taking supplies to Belize and for evacuating civilians to Jamaica. Two more Shackletons from the same squadron followed the next day, plus one from No. 210 Squadron (Wg. Cdr. J. F. Hatton) and one from No. 204 Squadron (Wg. Cdr. R. D. Doe), both based at R.A.F. Ballykelly. Two Hastings of No. 24 (Commonwealth) Squadron (Wg. Cdr. R. B. Sillars) Colerne, went out on Nov. 5, carrying spare crews and more freight.

Six Britannias from No. 99 and No. 511 Squadrons were used to airlift medical teams, medical and miscellaneous stores, and Army and R.A.F. personnel from the United Kingdom to Kingston for onward transmission to Belize. On a return flight one Britannia arrived in the U.K. at 18.40 hrs. on Nov. 7 having completed the longest non-stop flight by this type in R.A.F. service. Piloted by the C.O. of No. 511 Squadron, Wg. Cdr. A. W. G. Le Hardy, the aircraft flew from Palisadoes Airport to St. Mawgan, a distance of 4,160 miles, in 12 hr. 40 min., before flying on to Lyneham.

In addition to Service aircraft the Air Ministry chartered civil transports for the airlift from Lyneham to Kingston. Altogether a total of 293,000 lb. of freight and 750 passengers have been carried during the operation which is now coming to an end.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. N. T. Harvey to the Department of the Air Member for Personnel.

Bomber Command: Sqn. Ldr. B. Rejder to R.A.F. Coningsby as Wing Commander in charge of Operations, with the acting rank of Wg. Cdr.

Fighter Command: Wg. Cdr. R. G. Little, M.B.E., to the Central Fighter Establishment as Wing Commander in charge of Electronics: Wg. Cdr. G. A. L. Elliot, D.F.C., to R.A.F. Hack Green, to command.

Coastal Command: Gp. Capt. P. Norton-Smith, D.F.C., A.F.C., to command R.A.F. North Front, Gibraltar.

Flying Training Command: Wg. Cdr. N. E. Bowen, A.F.C., to R.A.F. Staff College, Bracknell, for directing staff duties; Sqn. Ldr. R. S. Kingsford, to R.A.F. Hornchurch as Deputy Commandant of the Aircrew Selection Centre, with the acting rank of Wg. Cdr.

Technical Training Command: Gp. Capt. R. J. H. De Brett to Headquarters as Senior Ground Defence Staff Officer; Wg. Cdr. T. M. G. Bury to No. 8 School of Technical Training, R.A.F. Weeton, as Senior Technical Officer.

R.A.F. Germany: Wg. Cdr. H. Harvey as Command Armament Officer; Wg. Cdr. G. F. Rogers, O.B.E., for accounts duties.

Near East Air Force: Wg. Cdr. C. W. Lovatt as Command Movements Officer.

Air Forces Middle East: Wg. Cdr. T. De T. MacDonald as Command Armament Officer; Wg. Cdr. G. G. Edwards as Command Education Officer; Wg. Cdr. D. B. Delany, A.F.C., for planning staff duties.

Far East Air Force: Sqn. Ldr. D. A. Maddox to R.A.F. Seletar as Officer in charge of Administration, with acting rank of Wg. Cdr.

R.A.F. Malta: Wg. Cdr. R. L. S. Couldson to R.A.F. Idris, to command.

Other Appointments: Wg. Cdr. E. L. Macro to Allied Forces Central Europe for staff duties; Wg. Cdr. P. J. Halford, A.F.C., to Warsaw as Air Attaché, with the acting rank of Gp. Capt.

More Service News

Manila Air Show.—The R.A.A.F. contingent to take part in the annual Philippines Aviation Week military air display at Manila on Nov. 26 will comprise six Sabres from No. 3 Squadron and two Canberras from No. 2 Squadron at R.A.A.F. Butterworth and a No. 36 Squadron Hercules from Australia. As previously recorded, three Vulcan B.1s from No. 44 Squadron at Waddington will represent the R.A.F. at the show.

Kenya Relief-1.—No. 21 Squadron (Sqn. Ldr. W. J. Bishop) operating four Twin Pioneers from R.A.F. Eastleigh, Nairobi, has completed a month-long series of mercy flights dropping food to Africans marooned by the recent floods in Kenya. Since the operation started on Oct. 1 the Squadron has flown a total of 257 hr. on 146 sorties and dropped 254,600 lb. of food. An additional 11,600 lb. of supplies has also been landed by the unit.

Kenya Relief-2.—Following an S.O.S. from the Governor of Kenya for aid on Nov. 16 four Sycamores from Odiham have been flown out to Eastleigh, Nairobi, in four Transport Command Beverleys. To speed the move four relief Beverley crews were positioned ahead at Aden. Beverleys from No. 30 Squadron, Eastleigh, and from No. 84 Squadron, Khormaksar, Aden, are also taking part in the food drops and rescue work. The first Sycamore left the U.K. within seven hours of Abingdon being alerted.

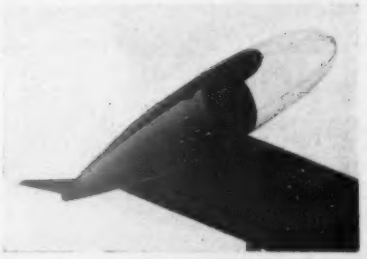
AID FOR BELIZE.—The first aircraft to leave the United Kingdom as part of Operation "Sky Help" were two Shackleton MR.2s of No. 42 Squadron, Coastal Command. Seen here at Belize airport, British Honduras, they flew out by way of the Azores and Bermuda.

Atlantic Details

As recorded in our issue of Nov. 9, the NATO Breguet 1150-01 Atlantic twin-engined anti-submarine aircraft was officially unveiled at Toulouse-Colomiers earlier this month. Here some of the more interesting features of the first prototype can be seen.

Right, the four sections making up the two 30-ft. weapons bay doors slide up on tracks over the outside of the lower unpressurized "bubble" of the double bubble fuselage. Below, the starboard nacelle containing one of the two Rolls-Royce Tyne RTy.20 Mk.21 turboprops, with de Havilland 16-ft.-dia. propellers, and Hispano-Suiza main landing gear.

Right, the starboard wing-tip fairing which will contain a searchlight. Below, the weapons bay looking towards the rear of the aircraft; one of the interchangeable beams for carrying stores can be seen.



Above, the main entrance to the upper-bubble pressurized crew compartment is through this trap door under the tail. There is also an emergency exit in the floor of the flight deck.

Mercury MA-5

ALTHOUGH hopes of getting the first of America's astronauts into orbit this year appear to have faded with the postponement of the attempt to launch a chimpanzee in the MA-5 capsule last week, the development programme is considered to be going well following the near-perfect performance of Mercury-Atlas 4 on Sept. 13. This single-orbit mission of a capsule containing a crewman simulator has been an important qualification test of the booster-capsule systems, including launching, automatic operation in orbit, re-entry, ground tracking and recovery.

The launching of Mercury-Atlas 5 will, however, place even greater demands on the spacecraft. It is intended to operate up to three times as long as the previous mission, with a young chimpanzee replacing the "breathing, sweating, talking" robot flown in MA-4 (THE AEROPLANE AND ASTRONAUTICS, Aug. 31, 1961, pp. 230-231). Thus the flight poses a critical test of all systems, particularly the spacecraft's Environmental Control System which must provide a liveable gaseous environment for later manned flights.

Flight Plan

Arrangements are that MA-5 will be launched into a 32° orbital path taking it over the Mercury world-wide tracking and communications network. A full three orbits would require about four and a half hours at altitudes ranging from approximately 100 to 150 statute miles.

Although the mission calls for a maximum of three orbits, the capsule could be commanded down at the end of the first or second orbit without compromising many of the flight objectives. In any case, as the vehicle approaches the West Coast of North America, the retro-rockets will be fired to initiate re-entry. One orbit would put the spacecraft down slightly east of Bermuda. Termination after two orbits would mean touchdown several hundred miles south of Bermuda. After three orbits the capsule would begin to enter the atmosphere over Southern California and encounter maximum 8*g* deceleration and 2,000° F. re-entry heating at an altitude of about 37 miles. In this event, touchdown would occur some 1,000 miles southeast of Cape Canaveral.

The MA-5 Spacecraft

The capsule itself has a height of 9.5 ft. and is 6 ft. across the base. With the jettisonable escape tower in place, the total height of the booster and spacecraft at launching is 93 ft. As in earlier Mercury flights, the spacecraft is designed to escape automatically should a fault develop during the boost phase of the mission.

Instead of two small portholes used in earlier capsules the MA-5 spacecraft will have a "picture window" 7 in. x 11 in. x 19 in. Capsules with the big window have been launched on three earlier occasions, twice in the Little Joe series of escape system tests and, more recently, in the second manned sub-orbital flight, Mercury-Redstone 4.

A fully operational Environmental Control System (ECS) has been included. The chimpanzee will be in a pressure-tight box of metal and plastic which is connected to the ECS suit circuit in the same manner that an astronaut's suit would be. The animal is held on to a form-fitting plastic pallet by a net harness.

Certain minor modifications have been incorporated in the environmental system to preclude the possibility of excessive oxygen consumption as occurred during the flight of MA-4. Post-flight investigation of that capsule disclosed that launch vibrations caused the manual handle controlling the emergency oxygen to move slightly, thereby allowing higher oxygen flow into the crewman simulator than was necessary. NASA point out that had an astronaut been aboard the MA-4, the problem would have easily been recognized and corrected. The MA-5 capsule will be the first Mercury mission to exercise the Environmental Control System with sufficient oxygen to support a three-orbit operation.

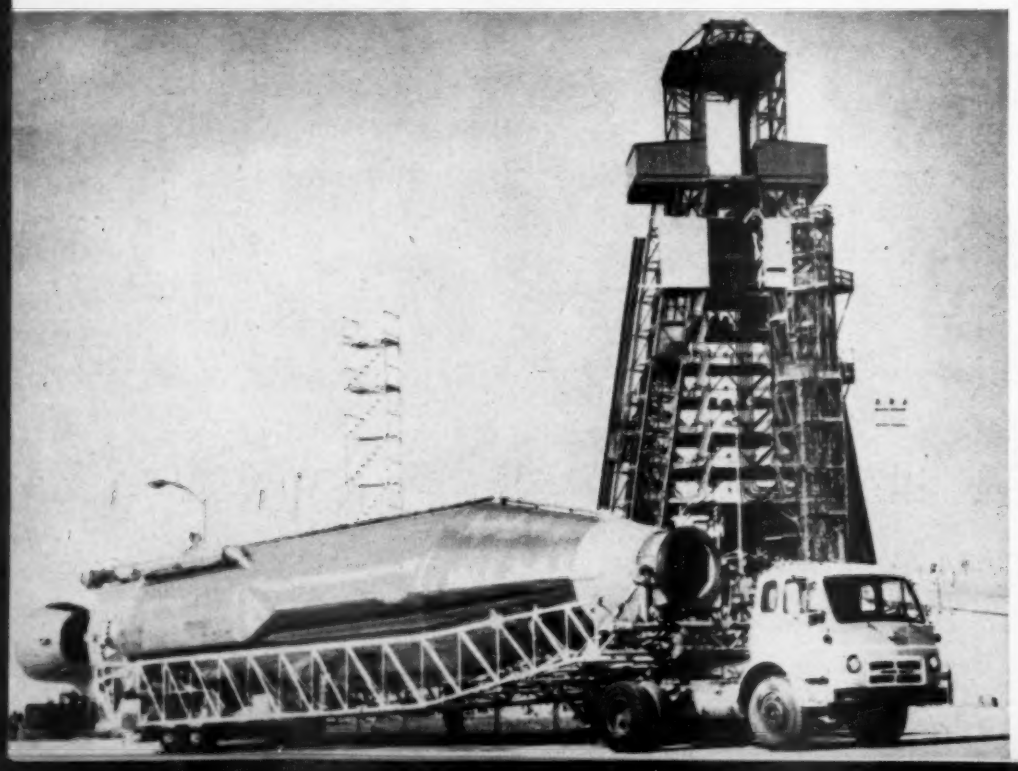
The spacecraft is equipped with a quick-release escape hatch, identical in design to that used in the manned sub-orbital flight of Capt. Virgil Grissom. It will be recalled that the MR-4 capsule was lost following the landing when the hatch suddenly blew out and the capsule filled with water and sank. The hatch is released by the ignition of a "pyrotechnic train" in the door frame which breaks the bolts securing the hatch.

Following the loss of the MR-4 capsule, an identical hatch was subjected to an extensive series of tests in a variety of environmental conditions.

In order to exercise and evaluate the voice communication system during the MA-5 mission, pre-recorded voice messages and periods of silence are provided on each of two playback tape recorders. The duty cycles allow for a short transmission from one tape and then a period of silence—at which time the other recorder and the applicable ground station will transmit.

Voice messages have been recorded by several of the astronauts for the purpose of assessing clarity and procedures. A typical transmission runs like this:

"Capcom, this is Astro. Am on the window and the view is great. I can see all the colours and can make out coast lines. Environment is okay. I feel great. Elapsed time is 02:48:30—Mark. Over." Another typical transmission might include a readout of instruments and reporting of control actions: "Fuel auto 90—manual 100, RSCS on, manual handle



The Atlas-D booster is moved up to the launching pad at Cape Canaveral in readiness for launching the MA-5 Mercury capsule. The orbital mission is scheduled to last about 4½ hours at an altitude of 100 to 155 miles. Recovery is planned at the end of the third orbit.

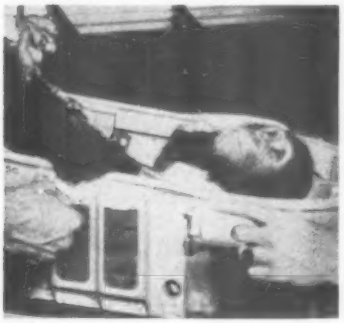
out, pitch handle out. Pitch up four degrees/sec. to minus 15."

Four separate camera systems are embodied in the MA-5 capsule. A 16-mm. primate observer camera situated on the main instrument panel will photograph the animal throughout the mission until near the time of landing. The camera is to the left of the periscope. A second 16-mm. camera, near the couch, will film the spacecraft instrument panel, providing coverage throughout the mission and for about three minutes after landing. A third 16-mm. camera will record the view seen through the periscope; it will operate for nearly three hours following injection of the capsule into orbit. Finally, a 70-mm. Earth-sky camera has been incorporated to provide coverage throughout the mission of the view from the spacecraft window. All cameras use high-speed colour film.

Radiation Measurement

As radiation levels during protracted space flights are an important consideration, four standard radiation packs are mounted in the spacecraft, one on either side of the positions normally occupied by the astronaut's head and feet. Two additional packs, which contain the same type, but thicker, emulsion than the standard packs, will measure the incident radiation spectrum. As compared to measuring total dosage, as indicated by standard packs, these will be used to determine the number and type of radiation to which the spacecraft has been exposed. They will also serve to determine the initial energy of the particles by measuring the depth of penetration.

Special attention is being given in the MA-5 capsule—as in MA-4—to the measurement of spacecraft heating. Some 78 heat-measuring instruments have been located in temperature sensitive areas of the capsule. No effort is being made to sample noise and vibration since data obtained from the previous Mercury flight indicated that neither was of sufficient magnitude to warrant further investigation.



One of the five chimpanzees short-listed for the MA-5 orbital mission. Each has been trained to pull a lever in response to a light signal and perform an "intelligence test" while in orbit.

The telemetering system allows for the action of every major event in the flight programme to be signalled to ground stations, as well as simultaneously recorded within the capsule. Other measurable quantities, such as acceleration, pressures, temperatures and spacecraft attitude, will be similarly telemetered and recorded.

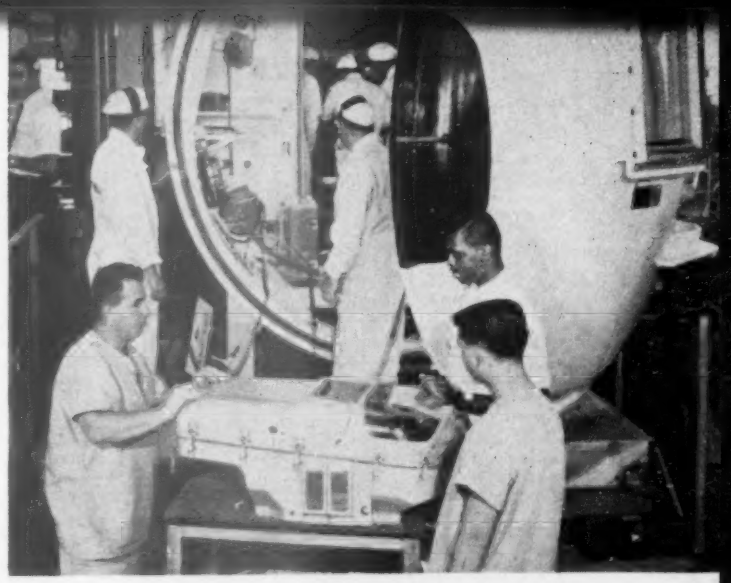
Animal Selection

Early in the Mercury programme, it was decided that prior to manned orbital flight, the Mercury spacecraft should be tested with an animal subject to demonstrate the adequacy of the various life support systems. In addition, it was agreed that the animals selected for this programme should be capable of learning simple psychomotor tasks which could be performed during flight, thus permitting evaluation of stresses imposed by acceleration and deceleration as well as the effects of prolonged weightlessness.

In the MA-5 the test-subject—a small chimpanzee—is placed in a pressure-tight container with a window dome. A liveable gaseous atmosphere of 100% oxygen maintained at room temperature and a pressure equivalent to 27,000 ft. altitude, will be provided by the spacecraft's Environmental Control System, located beneath the couch. This will provide the animal with the equivalent of the pressure suit of a human astronaut.

The final choice of occupant for the MA-5 spacecraft is being made between five "chimponauts," among them the veteran Ham which made a 155-mile-high ballistic flight in the Redstone-boosted MR-2 on Jan. 31, 1961. In the past six months, these animals, which have an average weight of some 40 lb. and are about four years old, have been learning a 70-minute programme involving four separate tasks.

The programme, which automatically recycles, includes rest periods, rewards of an occasional sip of water or a banana-flavoured pellet and—if the response is not up to par—a mild shock on the left foot. (Records show that the need for this last action—what psychologists call "negative reinforcement"—is "very infrequent.")



Sealed into a pressurized capsule, one of the Mercury chimpanzees is prepared for test in a high-altitude simulation chamber at Cape Canaveral.

The animal works at a waist-high shelf equipped with three levers beneath three display panels. In most of the tests, he is to react to a coloured light by hitting the appropriate lever under the light. In another test, he will study three symbols, two of which are alike. He must indicate which system is different—a kind of chimpanzee "11-plus"!

Bio-medical information telemetered from the spacecraft during flight will provide medical monitors at tracking stations with a running report on the animal's heart rate, blood pressure, respiration and body temperature. Directing the animal training programme in support of Project Mercury is the Bioastronautics Research Laboratory of Holloman Air Force Base, New Mexico.

World-wide Tracking

In the case of a successful launching, information from tracking and ground stations will pour into NASA's Goddard Space Flight Center at Beltsville, Md., at the rate, in some cases, of more than 1,000 "bits" per second. After almost instantaneous analysis, the information will be relayed to the Mercury Control Center at Cape Canaveral for the appropriate actions to be taken.

The fact that Mercury missions are accomplished in the short span of a few hours places the greatest possible demands on communications. Tracking and telemetered data must be collected, processed and acted upon as near "real" time as possible. The position of the vehicle must be known continuously from the moment of lift-off.

Mercury's ground network consists of 18 stations, the Mercury Control Center at Cape Canaveral being connected to the other 17 stations via a data processing and switching centre at the Goddard Space Flight Center. The entire network is now fully operational. Across the Atlantic are stations at Cape Canaveral, Grand Bahama Island, Grand Turk Island, Bermuda, Grand Canary Island, and a specially fitted ship stationed in mid-Atlantic.

In Africa, the network has sites at Kano, Nigeria and Zanzibar. Farther to the east is a ship in the Indian Ocean, and Australian stations at Muchea and Woomera. Canton Island in mid-Pacific and Kauai Island, Hawaii, are other essential links in the chain. The system also takes in stations at Point Arguello, Calif.; Guaymas, Mexico; White Sands, New Mexico; Corpus Christi, Texas; and Elgin, Florida. To form this great band of communications, some 20 private companies and public communication agencies throughout the World have provided leased land lines and overseas radio and cable facilities.

New Target Dates

As we reported on Nov. 2, it had been the intention to launch the MA-5 spacecraft complete with chimpanzee passenger on Nov. 14 as a final step before the first manned orbital flight by one of the seven American astronauts, probably Commander Alan Shepard or Capt. Virgil Grissom, both of whom have, of course, made successful ballistic flights in Mercury capsules. The leak in a hydrogen peroxide tank, concerned with the MA-5's orientation system, discovered during routine inspection on Nov. 12, has forced a delay of "at least a week and possibly longer." It will be good going now if the launching can be made before December.

The best estimate for the first manned flight is that the shot probably will not be attempted until February, 1962.—K.W.G.

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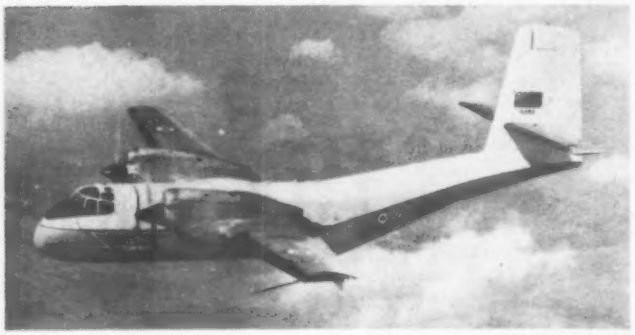

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Personal Flying

RE-EMERGENCE of interest in gyroplanes in the United States has been acknowledged by the Federal Aviation Agency by the issue of basic requirements for pilot flight tests in this type of rotorcraft. Many home-built single-seat gyroplanes are flying in the U.S., but the recent Flight Standards Service release was concerned particularly with the forthcoming public sale of the Umbaugh 18 two-seater.

This is said to be probable before appropriate changes in the regulations and Civil Aeronautics Manual 20 can be developed and published. Until then, it will be necessary for pilots seeking ratings on these aircraft to comply with the experience and knowledge requirements prescribed for all rotorcraft. The flight test described in the release will carry with its successful completion the issue of a Rotorcraft (Gyroplane) rating on pilot certificates, until a separate gyroplane class is established.

The flight test includes stringent examination on the aircraft documents; loading procedures; fuel, oil, electrical and hydraulic systems; preflight checks; normal and cross-wind take-offs and landings; all normal airborne manœuvres; high rate of descent approaches; 720° power turns; full and partial flare landings; short-field techniques; and emergencies.

● The London School of Flying has 34 students on full-time training courses for their professional flying qualifications, which is claimed as a record for any privately run training establishment in this country. Four are receiving financial assistance through the Derby Airways training scheme, for which next year's candidates must submit applications by Dec. 15. During the year ending Sept. 30, the school flew 6,825 hr. 30 min., and the addition of an Anson G-AMDA from Derby, shortly, and an extra Chipmunk G-ARGH to the fleet strength, should increase the potential for the coming year. Eighteen newcomers have also joined for P.P.L. courses.

● For the third year in succession, the Armstrong Whitworth Flying Group have been awarded the Masefield Trophy as the most efficient group in the Popular Flying Association. The AW Group operate from Baginton a Tiger Moth which members themselves service and maintain under the supervision of a qualified ground engineer.

● More news from Baginton comes with the official opening, on Nov. 11, of the Coventry Flying and Country Club. Operated by Devonair, Ltd., the club has nine aircraft available for flying training up to commercial standard, together with Link and social facilities.

● October was a record month for the Lancashire Aero Club, which flew a total of 130 hr. 50 min. This brought the total for the club year to 1,170 hr. 20 min., compared with 871 hr. 10 min. for the previous year. The lack of social facilities has been overcome with the discovery of a comfortable hotel near to the club hangar.

● The Norfolk and Norwich Aero Club at Swanton Morley now has a membership of 220, including 50 student pilots. Flying fees are to be increased from Dec. 1, to £2 15s. an hour solo and £3 5s. dual for the Tiger Moth, although the Auster remains at £4 an hour. These are still the lowest fees in the country, according to the Norfolk club. During September, nearly 120 hr. were flown on four aircraft, 47 hr. 35 min. being dual.

Gliding Notes

by Dr. A. E. Slater

NEW ZEALAND'S magazine *The Gliding Kiwi* celebrates the tenth anniversary of the formation of the New Zealand Gliding Association and its recognition by the civil aviation authority. During that period the number of gliders in the country has grown from eight to 38 and there are now 17 gliding clubs. Flying hours per year has grown from nearly 900 in 1956 to 5,000 in 1960/61.

The national height record for women has been raised by Mrs. Helen Georgeson to 18,000 ft. in a wave set up by the Southern Alps. When still at 15,000 ft., she asked her husband the time over the radio, realized she was expecting visitors to dinner in two hours, pulled out the brakes and descended. The visitors were late.

In the same magazine is an article about keeping the pressure equal on both sides of the ear drum. Between the middle ear and the throat is a tube with a valve which works well when you are going up, but shuts when you are coming down, unless you open it by swallowing or yawning.

So far, so good; but there is more than that to the ear drum for glider pilots, because it acts as a variometer. The ear drum is kept tight by a muscle, called "tensor tympani," which pulls it inwards; therefore it is immediately stretched when outside pressure increases, but when one is rising and outside pressure decreases, the ear drum has to take up slack before it begins to stretch.

This means that our ear drums, acting as a variometer, can detect downcurrents more readily than upcurrents. In fact, 30 years ago, I took an aneroid barometer in a Tube train, in which sudden variations of pressure are frequent and felt my ear drums stretching when the pressure increase was equivalent to a sudden drop of 40 ft.; but it needed a pressure decrease equivalent to a rise of 60 or 70 ft. to produce a sensation, which even then was rather vague. Wolf Hirth once claimed to have found a succession of thermals by means of his ear sensations alone, without a variometer.

It is significant that the "tensor tympani" of birds pulls the ear drum outwards, so that they should sense upcurrents more easily than downcurrents. A gliding biologist contradicted this idea and thought the air sacs, not the middle ear, acted as the vacuum flask of a variometer. This may well be, when the bird is soaring; but when it is flapping, the air rushes violently in and out of the air sacs on its way to the lungs.

* * *

AT the Kronfeld Club, the winner of the National Aerobatic Contest was billed to give a talk, and the audience turned up expecting Derek Piggott to describe his winning flight from start to finish. But we should have known better, for we got, instead, a quasi-philosophic dissertation on the art of giving aerobatic displays and winning contests.

By the time the note-book could be got out, Piggott was saying that, at anything more than 1,500 ft., a sailplane looks like a toy in the sky. But as it gets lower, it looks more interesting, especially when the pilot's head can be seen and the public can identify themselves with him. Spins, therefore, are better done at the beginning than at the end.

The lecturer had begun by emphasizing the difference between aerobatting to impress competition judges and knowledgeable people, and giving a display to the uninstructed public. A "clover leaf," for instance, does not impress the public unless the public address explains what is going on.

Another evolution that does not impress the public is the inverted loop. And if the commentator tries to impress them by saying that it is more dangerous than an ordinary loop, their reaction is to ask: "Then why doesn't he do it the right way round?"

Nobody explored the possibilities of looping at the Dunstable contest—"they were just loops," Piggott said, adding that there was a variety of ways of doing loops. One he described was to make a long sweeping upward leg, then turn over quickly at the top and glide away at a much higher level than the bottom of the approach.

There is also a difference in the kind of loops, and other manœuvres, best done by large and small machines. The short-span sailplane should do small loops and quick rolls, and avoid long dives as it cannot gather much speed. With a large span, however, sweeping manœuvres should be done in a large flowing style. The judges, Piggott asserted, would be "unconsciously influenced" by these considerations.

For a machine stressed for inverted flying, many more manœuvres are available, and it is a good idea to finish each manœuvre upside-down and start the next one from that position. But then one must be careful not to increase speed before going into a dive, or it is easy to exceed the permitted maximum. One must also be careful, when near this maximum, to avoid violent movement of the controls; and it is particularly liable to be exceeded during the second half of a barrel roll.

Derek Piggott plans his aerobatics with the aid of a model; but even after doing so, he puts up a written programme in his cockpit, to make sure he won't forget. And, of course, one should practise beforehand. Nothing, he said, looks worse than a pilot changing his mind in the middle of a manœuvre.

Before we leave the subject of aerobatics, mention should be made of the death of Albert Falderbaum, who won three successive German aerobatic contests, in 1938, 1939 and 1960, and in recent years made a reputation for sailplane aerobatics. He would finish his display with a high-speed glide upside-down just above the aerodrome, followed by a half-roll and landing; he did this in a display at last year's World Championships near Cologne.

Some years ago, during this display, he caught his rudder on the ground and crashed into a stationary jet aeroplane. His death near Augsburg, at the age of 48, was due to his parachute failing to open when he jumped from a light aeroplane in an uncontrollable spin.

Correspondence

Effective Fog Dispersal

I HAVE read with interest the article entitled "Fog Dispersal Methods" which appeared in your issue of Oct. 5, 1961, and in which you summarize an article by Mr. K. H. Stewart reviewing research carried out in various countries on the dispersal of fog over airports.

With regard to the experiment tried out at Orly Airport for the dispersal of fog by the diffusion of propane, the very concise account reports skidding of motorists on the snow, the fall of which had been caused over an area of about 20 km^2.

But the essential result—dispersal of fog over Orly Airport, thus allowing planes to take off—was not put forward.

Here are some brief indications which it would have been useful to have given in the article.

On Jan. 18, 1961, with a temperature between −2° and −1.5° C., Orly Airport was covered by a layer of fog of a thickness between 300 and 500 metres. Before the beginning of the experiments, the ground-lighting visibility inside this fog was recorded as being lower than 250 metres. In the course of the experiments the visibility on the main runway increased to 800 metres, permitting the take-off of 18 aircraft and the landing of two, while, on the fringe of the phenomenon, meteorological visibility remained lower than 150 metres.

It must furthermore be noted that this was an experimental operation, and that adjustment of the devices and conditions of emission of the propane, and of the control equipment, is being proceeded with, so that this method can be systematically put into operation.

Direction de l'Eqquipment et des Installations,
Aeroport de Paris,
Paris 14e.

E. BECKER,
Chief Civil Engineer.

Radials and Rotaries

L. KEULEYAN writing from Paris (Oct. 12) says the Le Rhône and Clergets were radials. They were in fact rotaries. Maybe he doesn't comprehend the niceties of the English language. In English a radial had stationary cylinders fixed to the crankcase. In a rotary, cylinders and crankcase revolved round a stationary crankshaft. It sounds crazy maybe to the present generation but it worked as well as, or better than, more orthodox aero engines that were produced in the early days.

London, W.14. GEOFFREY DORMAN.

The Landing Problem

I FIND the landing problem as dealt with in OPtional Reading very interesting, but I must quarrel slightly with a statement in No. 15 (Oct. 12).

Certainly, if the 1*g* stall speed is 104 knots, then the 1.3*g* stall speed is 118 knots (and this is not tied, as your contributor C.C.J. implies, to the particular weight, wing area and flaps, but applies to all combinations giving 104 knots), but the book threshold speed of 130 knots (1.3 times the certification stall speed of 100 knots) in the example given is not supposed to provide a 30 knots margin above the instantaneous genuine stall speed during the round-out—it is only supposed to provide such a margin that a round-out can easily be made without stalling at the kind of *g* level likely to be needed and allowing for the difference between certification and genuine stalling speeds.

The 12 knots arrived at, correctly, by your contributor should be ample for the purpose—after, all, it represents 21% spare lifting capacity.

I trust that C.C.J. will note with approval that I have not dragged angle of attack into the argument—yet!

Elstree, Herts. C. O. VERNON.

Russia's Venus Probe

FURTHER to previous correspondence on the orbit of the Russian Venus probe resembling an earlier suggestion of von Pirquet, the following may be of interest.

A recent paper in a publication of the American Astronautical Society ("Nomographs to determine velocity requirements for interplanetry trips to Mars and Venus," J. V. Breakwell, R. W. Gillespie and S. Ross, *Astronautical Sciences Review*, April/June, 1961) gives the results of computed data on orbits to Venus. The authors locate the Venus probe orbit as a point on a contour map showing the relation between journey time, vehicle performance requirement, and date of launching.

It is evident from their diagram that:—

(1) The probe was launched on an orbit that called for the minimum performance requirement at the date of the launching.

(2) The performance requirement would have increased appreciably had the launching date been long deferred.

This would seem to strengthen the view that the Russian's had their own reasons for the selection of the orbit, and that resemblance to von Pirquet's orbit is coincidental.

London, W.8. S. W. GREENWOOD.

Groundabout

The Machines are Winning. Inspired by the shining example of the Vanguard's built-in steps which have helped B.E.A. to keep some services going in spite of the L.A.P. loaders' strike, aircraft designers are hastily rehashing our newest airliners to match the equally hastily conceived airport mods. which aim to dispense with tarmac staff altogether. A list of these revolutionary devices is, I think, self-explanatory: Aircraft Positioning Travelator with Magic-Eye Parking; Pre-Packaged Baggage Transporter; Automatic Fuel-oil Dispenser; Sanitation Exchanger; Integral Cabin Cleaner, and many others. And the passengers? Oh, those old things—they can *walk*.

*

Light on a Sound Subject. Frank Smith, the R.Ae.S. Librarian, keeps a sharp eye (all right, Frank, *two* sharp eyes) on this column and chides me when he thinks I've asked for it. I don't mind, because he also contributes to your entertainment now and then. For instance, when he saw the Limerick here about the scientist of Staines who is searching for a sound which is faster than planes, he put on his rhyming boots, with the following dire result:

Your fellow from Staines may be right
But he's making his schedule too tight.
A fellow from Woking
Has a plan (I'm not joking)
For a craft that is faster than light.
(The implication's plain to see—
I get there ahead of me).

*

True Story, Bedad. Flying from London to Ireland the other day, a friend, who we'll call Desmond, had a seat right at the back. On arrival, passengers slowly disembarked from a front door and Desmond waited patiently for his turn. Then the rear door was opened, for servicing staff, so he thought he'd go thataway. At the bottom of the steps a uniformed colleen told him "Sorry, sorr, you can't come this way—would you please return and leave by the front exit?" Stifling his exasperation he mounted the steps, then half-way up he turned and asked "Why the devil can't I leave *this* way?" "Well, sorr," said the little lady, "those steps aren't safe for passengers."

*

Overheard in the Mess Bar

"I agree with you all that this official book on Bomber Command is the absolute end. Now, has anybody actually *read* it?"

*

One of Those Things. A Nandi (Fiji)-Auckland TEAL Electra, diverted from fog-bound Auckland (says *Aircraft* of Australia) landed at Ohakea, 100 miles north of Wellington. A few minutes after landing, the captain learned Auckland was reopened. But it was necessary to bring staff and kit from Wellington by road to start the aircraft. Wellington-bound passengers, who wanted to quit the aircraft to journey to their nearby hometown, were not able to because there were no Customs or immigration people. But there were agricultural inspectors who seized the Electra's food.

by Gren

Industry Record

Kollsman-Smiths Agreement

All orders for Kollsman products at present in the hands of Kelvin and Hughes, Ltd., and/or the Smiths Aviation Division of S. Smith and Sons (England), Ltd., will be fulfilled and serviced by those organizations. Future orders for Kollsman products will be the responsibility of Kollsman Instrument, Ltd., of Bracknell, the new British company who are to be exclusive sales agents in the U.K. for the Kollsman Instrument Corporation.

This news was announced after a meeting in New York on Nov. 6 between management representatives of the Kollsman Instrument Corporation and Smiths Aviation Division. In the past a licensing agreement has existed between Kollsman and Kelvin and Hughes (absorbed into Smiths Aviation Division in August) whereby the American company's products were manufactured in this country.

It was also agreed that Smiths and Kollsman should continue to work together and make whatever agreements were found necessary to satisfy the requirements and needs of the customer.

Settled in Kent

At Whitstable, Kent, the electronics division of Amphenol-Borg, Ltd., is now fully operational in a new 34,000-sq.-ft. factory, adjacent to that of the Borg Fabric division. It produces specialized connectors and other components for military uses and for the aircraft, electronics and communications industries. Amphenol-Borg is the U.K. subsidiary of the Amphenol-Borg Electronics Corporation of Broadview, Ill., U.S.A.

The new factory incorporates the latest production methods and in view of its development of special-purpose connectors—particularly in the micro-miniature field—a "white room" is being fitted out so as to give the cleanest manufacturing conditions for this type of component.

The Amphenol electronics division is under the general management of Mr. E. H. Twaits, a former executive director of the Plessey Co.'s components division.

Computers and Production Control

Under the above title the Institution of Production Engineers has published a report of the findings of a research and technical sub-committee which for the past two years has been investigating the possibilities of using computers for production control in the manufacturing industries.

The contents include a description of the various types of computer; a definition of production control and how it may be applied; the economic assessment of a computer system; the conclusion reached by the sub-committee; and typical case studies. Copies of the report, price 7s. 6d. (including postage and packing), are obtainable from the Institution's publications department, 10 Chesterfield Street, London, W.1.

Vehicle R/T for B.E.A.

B.E.A.'s VHF ground communication network at London (Heathrow) Airport is to be supplemented by five Type 109 transmitters and receivers on order from the Cossor Communications Co., Ltd.

For some years now the Corporation has used radio telephones for apron control of vehicles and also other tasks within the airport. Four pairs of the new units will be operated via G.P.O. lines from separate control stations, the fifth being held in reserve. Each station operates on a separate channel; the mobile units can be switched to converse with individual stations.

Cleanliness at Ansty

Use in industry of a "clean room" for the assembly and servicing of sensitive and precision equipment has become recognized as a necessity. Now at the Ansty works of Bristol Siddeley Engines, Ltd., a "suite" of seven such rooms has recently been completed by John Bass, Ltd., specialists in clean room installations.

The rooms which make up the clean areas occupy a total floor space of 51 ft. 4 in. by 61 ft. 4 in. The largest room has a roof span of 40 ft. by 30 ft. Total volume is 33,000 cu. ft. of which 19,400 cu. ft. is devoted to an ultra clean area. This section is fully-air-conditioned and incorporates temperature control (68° F.), humidity control (30% R.H.) and filtration down to 1 micron.

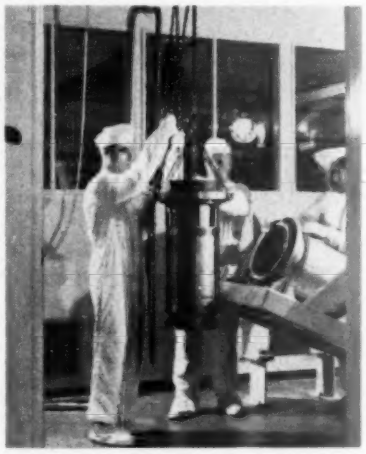
In the semi-clean room, an area of 13,600 cu. ft., the air is filtered down to 5 microns with up-heating only. This system operates on 100% fresh air intake which provides adequate ventilation as and when required.

The timber and hardboard structure of the Bristol Siddeley rooms is sprayed inside with P.V.C., to provide an effective seal against the infiltration of dirt and moisture and one which remains unaffected by any movement of the structure it protects. The lighting for the room is external, fluorescent fittings resting on ¼-in. wired glass panels sealed into the ceiling.

The floor, too, is protected by P.V.C. sheeting. To prevent dirt entering from an open door, two doors are arranged in the form of an "air-lock," electrically interlocked so that one must be closed before the other can be opened.

A vacuum system has been supplied for cleaning and an air dehydration plant supplies air with a dewpoint of −25°C. and cleaned to 0.5 microns. A refrigeration system for the air conditioned plant incorporates air-cooled condensing sets, built up in banks so that should breakdowns occur, the entire installation does not cease to function.

The fans used for air circulation are the centrifugal type, as they possess a low tip speed with a low outlet velocity so as to keep the noise level down to a minimum. The entire system is served by P.V.C. ducting to eliminate any possible contamination from this source.



The final build-up room at Ansty where temperature is controlled to 68° F and relative humidity to 30%.

Aviation Calendar

Nov. 23

London.—R.Ae.S. lecture, "Flight Characteristics of the B-58 Mach 2 Bomber," by B. A. Erickson, at 4 Hamilton Place, W.1, at 18.00 hrs.

Nov. 27

London.—R.Ae.S. Historical Group lecture, "The Society's Library and Aeronautical History," by F. H. Smith, at 4 Hamilton Place, W.1, at 18.00 hrs.

London Airport.—Institute of Transport, West Middlesex Group lecture, "A Pilot's View of Air Transport," by O. P. Jones, at London Airport Central, at 18.00 hrs.

Nov. 29

Weybridge.—R.Ae.S. R. K. Pierson Memorial Lecture, by Air Marshal Sir Geoffrey Tuttle, at the Apprentice Training School, Vickers-Armstrongs (Aircraft), at 17.45 hrs.

Nov. 30

London.—GAPAN Professional Licence Holders' Meeting and Annual General Meeting, at the Innholders Hall, College Street, E.C.4, at 14.30 hrs. and 18.45 hrs. respectively.

Dec. 1

London.—R.Ae.S. Rotorcraft Section. All-day Symposium, at 4 Hamilton Place, W.1, beginning 09.30 hrs.

Dec. 5

London.—Aviation Forum lecture, "The Royal Aeronautical Society's Place in Aviation," by Dr. A. M. Ballantyne, at the R.Ae.S., 4 Hamilton Place, W.1, at 19.00 hrs.

Dec. 6

Hayes.—R.Ae.S. London Airport Branch lecture, "Aviation Fuels," by W. S. Little, at the Fairey Lecture Hall, at 18.15 hrs.

Dec. 7

Manchester.—British Institution of Radio Engineers, North West Section lecture, "Radar for Civil Aviation Purposes," by K. F. Slater, at Manchester College of Technology, at 19.00 hrs.

Prestwick Airport.—R.Ae.S. Glasgow Branch film show, at Scottish Aviation, Ltd., at 19.30 hrs.

Dec. 12

London.—R.Ae.S. Astronautics and Guided Flight Section lecture, "Military Design Requirements of Guided Missiles," by Brig. E. W. Denison, at 4 Hamilton Place, W.1, at 18.00 hrs.

Luton Airport.—R.Ae.S. Branch lecture, "707 Operation," by Capt. H. L. Fry, in the Napier Senior Staff Canteen, at 18.00 hrs.

Company Notices

NEW COMPANIES

Air Holdings, Ltd. (707,242).—Private co. Reg. Nov. 3. Cap. £100 in £1 shrs. To acquire for the purposes of amalgamation and to hold not less than 90% of the issued share capital of British United Airways, Ltd., and to carry on business as an investment holding company. Sols.: Linklaters and Paines, 59-67 Gresham Street, E.C.2.

E-A Space and Advanced Military Systems, Ltd. (706,717).—Private co. Reg. Oct. 30. Cap. £100 in £1 shrs. To provide services in respect of and to manufacture and deal in automation, control measuring laboratory and analytical systems in connection with the control, operation and indication by electronic, electrical, mechanical, pneumatic and other means of space and military systems of all kinds. Directors: Edgar O. Herzfeld, 124 College Road, S.E.19 (director of Elliott-Automation, Ltd., etc.); Henry Pasley-Tyler, Coton Manor, Guilsborough, Northampton (director of Elliott Brothers (London), Ltd., etc.). Sec.: J. Daltrop, W.1. Reg. off: Century Works, Lewisham, S.E.13.

V.T.O.L. Patent 715,102, Ltd. (707,189).—Private co. Reg. Nov. 2. Cap. £100 in £1 shrs. To acquire patent 715,102 for vertical take-off and landing and other inventions. Claude B. Morrison and Mrs. Sybil C. Monk are the first permanent directors.

New Patents

APPLICATIONS ACCEPTED

885,663.—**N. Laing and B. Eck.**—"Aircraft." Dec. 6, 1957. (Dec. 7, 1956; Dec. 31, 1956; and April 18, 1957.)

885,683.—**General Electric Co., Ltd., and Minister of Aviation.**—"Aircraft landing aid systems." Aug. 31, 1959. (May 29, 1958.)

885,652.—**A. M. Young.**—"Convertible aircraft." Nov. 17, 1958. (Nov. 27, 1957.)

886,655.—**Short Brothers and Harland, Ltd.**—"Aeroplanes adapted for vertical take-off." May 13, 1960. (June 23, 1959.)

Printed specifications of the above will be available on Dec. 28, 1961, and the opposition period will expire on Mar. 28, 1962.

Personal Notices

BIRTHS

Barham.—On Nov. 5, at R.A.F. Upavon, to Jane (*née* Bosworth), wife of Sqn. Ldr. D. G. A. Barham—a son.

Hacke.—On Nov. 7, at R.A.F. Breighton, Yorks, to Jeanne-Marie (*née* Heighton), wife of Sqn. Ldr. Z. Hacke—a son.

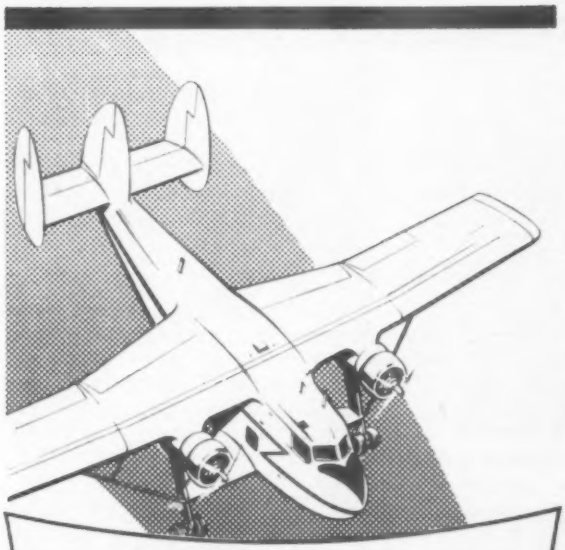
Le Brocq.—On Nov. 8, at St. David's Hospital, Bangor, to Mary (*née* Scriven), wife of Flt. Lt. R. H. B. Le Brocq—a son.

Montague.—On Nov. 12, at B.M.H. Hostert, Germany, to Lynn (*née* Cole), wife of Flt. Lt. E. Montague—twin daughters.

Podger.—On Nov. 12, at R.A.F. Hospital, Nocton Hall, to Hilda (*née* Jones), wife of Flt. Lt. C. J. Podger—a son.

DEATH

Free.—On Nov. 13, Gp. Capt. H. R. Free, O.B.E., A.F.R.Ae.S.



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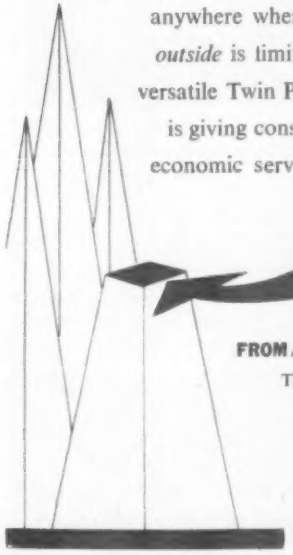

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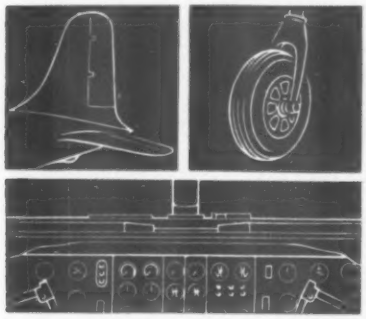

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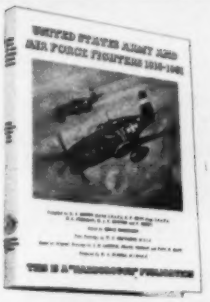

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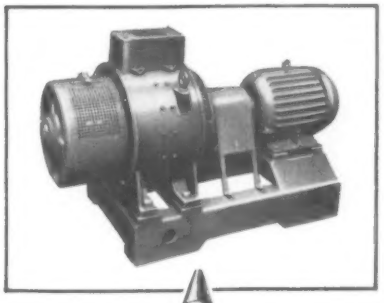

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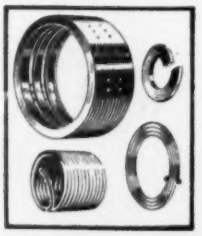

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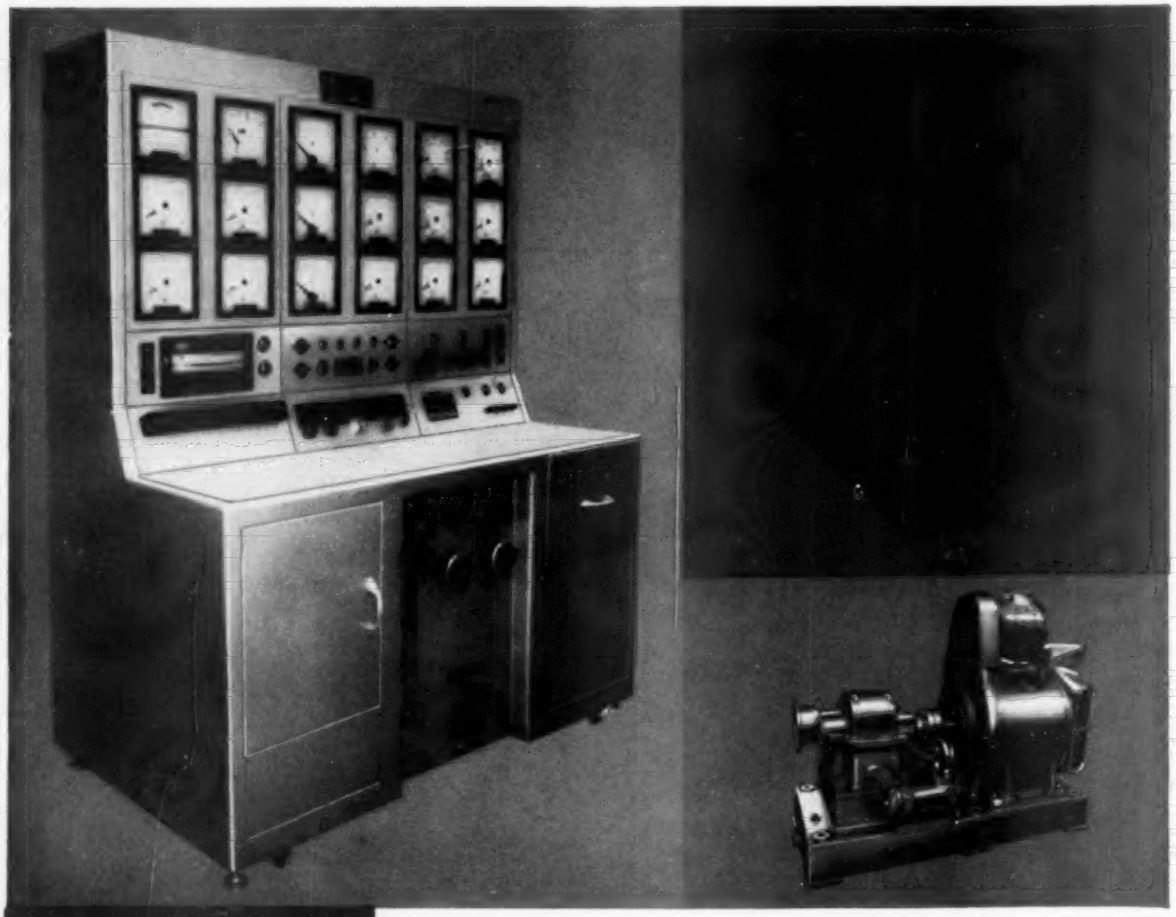

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